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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF MISCELLANEOUS INFORMATION

1926

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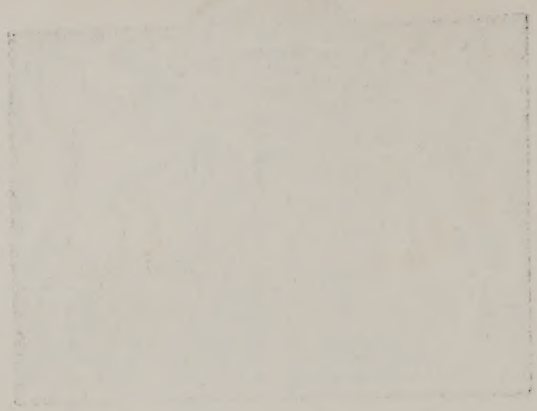

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ERRATUM.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1926
ROYAL BOTANIC GARDENS, KEW

I.—TAXONOMIC AND GENETICAL NOTES ON SOME SPECIES OF NEMOPHILA.

R. J. CHITTENDEN and W. B. TURRILL.

It is proposed to deal here with only those species of *Nemophila* of which some varieties have been studied in living material. An attempt has been made to delimit the species discussed by the application of evidence derived from observation of living plants, experimental breeding work, herbarium examination, and cytology. The results published here suffer from the limitations that (1) neither of us has studied the genus in its native habitats, (2) that seeds of some of the so-called varieties of *N. Menziesii* have not been available, (3) that the material used in the experiments was not grown from wild seeds of known locality.

As every naturalist is aware, no consistency in the use of the term species has ever been arrived at. Even within the limits of a single genus, whether of animals or of plants, the greatest diversity, both as to standard and as to practical application of any standard, obtains. Nevertheless, utilizing the comprehensive formula that a species is a group of individuals presenting close morphological and physiological relationships and capable of freely interbreeding, we believe this paper to be of value in providing examples of the delimitation of closely associated groups by the fact that they are unable to breed together, though they have been united as a single species. We would suggest that a revision of other groups on lines similar to those here followed, namely, by the correlation of the results of both systematic observation and genetic experiment would at least contribute towards a more uniform application of the conception of specificity, and to a classification according more closely with physiological fact. The vegetative distinctions as seen in living plants, between the six species of *Nemophila* discussed are, fortunately, sharp, and intersterility between the species, where we have shown it to exist, is complete.

In 1923 experiments were started at the John Innes Horticultural Institution, Merton, with Nemophilas bearing the following names:—*N. insignis grandiflora*, *N. crambeoides*, *N. atomaria atrocoerulea*, *N. Menziesii*, *N. atomaria*, *N. discoidalis*, *N. maculata*. In 1924 other plants were received from Benary as follows:—*N. insignis alba*, *N. insignis marginata*, *N. crambeoides alba*, *N. discoidalis marmorata*, *N. discoidalis auriculata*, *N. discoidalis argentea*, *N. australis integrifolia* and *N. aurita*.

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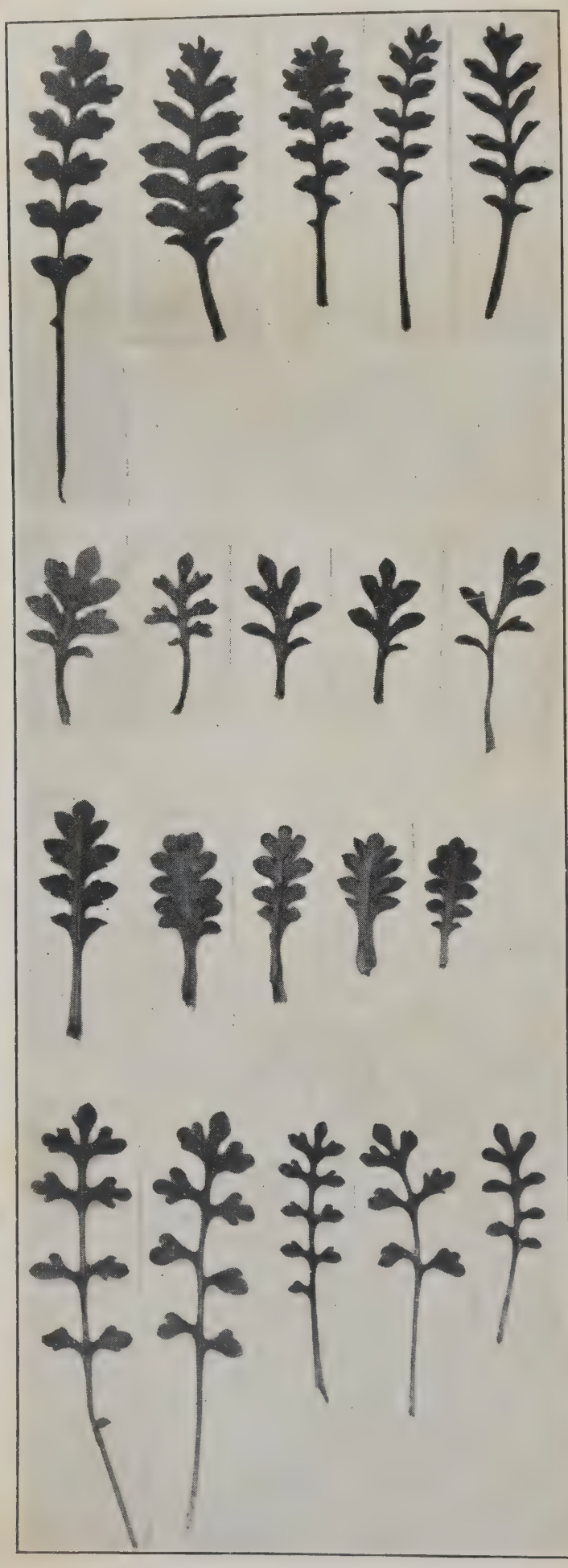
Apart from differences in flower colour and pattern, the varieties mentioned above fall into six well-marked groups when classified on their vegetative appearance. These groups coincide with *N. aurita* and *N. maculata*, and the four sub-species of *N. Menziesii* as given by Brand in Das Pflanzenreich iv. 251 (1913). The classification adopted by Brand for those species of *Nemophila* with which this paper deals is given below, our plants being grouped under the name of that species or sub-species to which they must be relegated on this system.

Haploid chromosome number.*	Species.	Sub-species.	Horticultural designations.
	N. aurita		
9	*N. maculata*		*grandiflora.*
9	*N. Menziesii*	*insignis* (group 1.)	*grandiflora alba.* Large flowered pale mauve.
9		*liniflora* (group 2.)	*crambeoides* *atomaria atrocoerulea* *crambeoides oculata albo-nigra.* *crambeoides alba.* Purplish blue with spotted eye.
9		*atomaria* (group 3.)	*atomaria* *discoidalis* *discoidalis marmorata* *discoidalis auriculata* *discoidalis argentea.* " Ghost."
		australis (group 4.)	" *integrifolia.*"

* From the numbers so far ascertained it appears that n=9 is the basic chromosome number for the genus *Nemophila*. In the neighbouring genus *Phacelia* the number n=11 has been found in the species so far examined.

The two species *N. maculata* and *N. aurita* can be very briefly considered. They have been described frequently and their status as species is not in question. *N. maculata* dates from Benth. ex Lindl. in Journ. Hort. Soc. iii. 319 adn. et 320 cum icone (1848). It is limited to the Sierra Nevada and the coast range in California, and is said to extend from Butte County to Tulare County. All the specimens at Kew are from the western hills of the Sierra Nevada, around Sacramento, Amador, Placer, and Auburn. *N. aurita* dates from Lindl. Bot. Reg. xix. t. 1601 (1833). The exact boundaries of its natural distribution are somewhat doubtful. It has been recorded from Plumas County but had possibly escaped

PLATE II.



N. insignis.

N. liniflora.

N. atomaria.

N. integrifolia.

To face page 3]

from cultivation. At Kew there are specimens from Santa Clara Co., just south of San Francisco, from Ventura Co., St. Barbara, Santa Catalina Is., and south to San Diego Co. The var. *arizonica* Brand [*N. arizonica* M. E. Jones in Contrib. West. Bot. xii. 50 (1908)] is represented by a specimen from the Sierra Tucson (*Pringle*).

We come now to the more perplexing groups of plants collectively to be known as *N. Menziesii* sensu Brand. Before considering this name it will be best to deal with the four sub-species of Brand. These, it is shown below, are isolated by being incapable of crossing one with another and are therefore to be considered as separate species.

1. *N. insignis* Douglas ex Benth. in Trans. Linn. Soc. xvii. 275 (1835) et Trans. Hort. Soc. 2nd ser. i. 479 (1835). This is morphologically an easily distinguishable plant, recognized by its large monochrome (usually clear blue) corollas. Its characters are very constant in cultivation and the range of variation is, in our experience, not great. It is common in gardens and has been frequently figured, as in Lindley, Bot. Reg. xx. t. 1713 (1835) and Bot. Mag. t. 3485 (1836). Geographically it is distributed in California from the San Francisco district to the Mexican border at San Diego. There is no doubt about the nomenclature although Douglas collected plants of other species as well, and these have sometimes been mounted on the same sheets as specimens of *insignis*.

2. *N. liniflora* Fisch. et Mey. Sert. Petropol. t. 8 (1846). The excellent figure and description of the original publication makes certain the correct application of this name to plants with flowers generally smaller than those of *insignis*, corollas with well-marked usually coloured veins, and the "eye" spotted or solid black (except in white forms). The reflexed hairs on the stem and pedicel are also characteristic. Geographically the species is limited to the region around San Francisco. Specimens at Kew are from San Bruno Hills, San Mateo County, Sonoma County and Santa Clara County.

3. *N. atomaria* Fisch. et Mey. Ind. Sem. Hort. Petropol. ii. 42 (1835). This species is morphologically very closely related to the last. The thicker texture of the leaves, the colourless margins to the corolla lobes, and the greater development of spots, stripes, or solid colour serve to distinguish it. Figures of it will be found in Bot. Reg. t. 1940 (1837) and Bot. Mag. t. 3774 (1840). The variety *discoidalis* is figured in Flor. d. Serres ii. Aug. 1846. t. 7. The species is said by Brand to occur from Oakland in southern Oregon to Santa Cruz County in California. The wild material at Kew is insufficient to check this statement.

4. *N. integrifolia* Abrams Fl. Los Angeles 321 (1904). It is unfortunate that this unsuitable name has to be used, the more so that the specimens of the Merton experiments are not the *N. Men-*

ziesii var. *integrifolia* Parish in Erythraea vi. 91 (1898) although they must be placed, in Brand's classification, under his subsp. *australis*. Judging from the meagre description and the solitary sheet at Kew (*Hall* 3081), our plants come nearest to the var. *incana* Brand. Living material of the var. *integrifolia* of Parish, of authentic var. *incana* Brand, of var. *annulata* Chandler and of var. *minima* Brand is not at present available. If these groups interbreed with one another and with our plants, as is probable, they will almost certainly be found to form one species isolated by not being fertile with other species. On the rules of nomenclature the name *N. integrifolia* has to be given to this species, and a number of varieties placed under it, including our plants, which are not, however, the var. *integrifolia*. Using the combination *N. integrifolia* as here suggested it is of interest to note that the species is geographically limited to the south-west of California from Los Angeles and San Bernardino to San Diego. It has normally smaller corollas than *N. insignis*, *N. liniflora*, or *N. atomaria*.

There remain for mention four specimens whose like we have not seen amongst living plants:

(1) San Bruno Hills, San Francisco, Apr. 1903, *C. F. Baker* 1895, determined by Miss Eastwood as *N. insignis* Dougl. form., and the number quoted by Brand as *N. Menziesii* subsp. *insignis* var. *typica*. We should not hesitate to place this in *insignis* except for the fact that spots occur on the lower parts of the corollas.

(2) Amador County, Irishtown, *Hansen* 87, the number quoted by Brand under *N. Menziesii* subsp. *insignis* var. *typica*. The narrow leaf-segments and spots on the lower parts of the corollas separate this from *insignis* as we know it in the living condition.

(3) Hills near Berkeley, Alameda County, *H.P. Chandler* 6076, number quoted by Brand under *N. Menziesii* subsp. *liniflora* var. *intermedia*. The hairs of the stem and pedicels are not closely adpressed and reflexed.

(4) Potter Valley, Merdoc County, *C.A. Purpus* 1099, with the hairs spreading, reflexed or slightly ascending.

It is probable that Nos. (1) and (2) are to be placed under *N. insignis* and Nos. (3) and (4) under *N. liniflora*, but without studying living plants showing the combination of characters seen in these specimens we are not sure.

We have now to consider the name *Nemophila Menziesii*. It was first applied in Hooker and Arnott, "The Botany of Captain Beechey's Voyage," p. 152 (1833). No definite specimen is quoted and the description is insufficient to determine the species intended —that is as species are understood by us. In the Supplement to the same work, p. 372 (1840), a better description is given under the same name, and two varieties are made *α* and *β*. The latter is, from the synonomy and figures quoted, *N. insignis* Benth.,

the former is probably *N. liniflora* Fisch. et Mey. The specimens from Hooker's herbarium at Kew are too poor to decide the question. The name *N. liniflora* is accompanied by a good description and by an excellent coloured figure and there is no ambiguity in its use. We propose therefore to retain it and to consider the name *N. Menziesii* Hook. et Arn. as ambiguous when used for one of the species as accepted in this paper.

The table of characters on the following pages has been drawn up from living specimens. The descriptions apply to normal living plants grown under normal conditions. Some exceptions to the descriptions are:—

1. In hot, dry weather, such as the early summer of last year (1925), the amount of anthocyanin in the plant becomes greater than usual, and even the leaves often become purplish-red.

2. The flower size is usually very constant. Some flowers, however, on an otherwise normal plant may be very small, such reduction in size is usually accompanied by contabescence of the anthers, though the female parts may be normally functional. Further, toward the end of the flowering season both flower shape and size may be affected, size being much reduced and in *atomaria* petals may become narrower as they are in *liniflora*.

3. Meristic variation is frequent. On an otherwise normal plant a flower or flowers may show: —4 or 6 instead of 5 petals, tri- or multi-fid stigmas instead of bifid ones, capsules 3- or 4-valved instead of 2-valved.

4. The reflexed appendages of the calyx may be wanting, particularly in *atomaria*.

5. The flower colour is affected by heat or drought, for instance the white rim of the petal characteristic of all *atomaria* varieties may on some or all flowers of a plant become purple.

Flower Colour and Pattern.

A description of flower colour in these plants is rendered easier if the corolla be regarded as divided into four zones, w, x, y, and z, of which z is the innermost and w the outermost zone (see diagram p. 10).

N. insignis.	*N. liniflora.*
Habit. When young a close rosette. Later erect and loosely branched, finally prostrate. Plant larger than *liniflora*, *atomaria* or *australis*.	The plant does not form a close rosette when young and soon becomes prostrate and loosely branched.
Stem. Brittle, rounded and slender.	As in *insignis*.
Anthocyanin. If present is localized in the leaf axils and the bases and apices of the stems.	Usually present, may be confined to the leaf axils, bases and apices of the stem, or may be general over the plant.
Hairs. Plant hairy all over, hairs on the stem and pedicel are adpressed and ascending.	As in *insignis*, hairs on the stem and pedicel are adpressed but reflexed.
Leaf. Usually 2–4 times as long as broad. Lobing deep and regular, 4–7 pairs of lobes. Lobes usually with 1 to 2 pairs of lobules. Small white air spaces on the leaf.	Usually 1–1½ times as long as broad. Lobing not so deep or so regular as in *insignis*, 1–3 pairs of lobes, lobes narrow usually with only one lobule on the anterior margin of the lobe. White air or black anthocyanin blotches on the leaf, never both on the same plant. No apparent correlation between the amount of anthocyanin in the stem and the character of the blotches on the leaf.
Calyx. Sepals 5, broad, large, tapering to the apex, with a small reflexed appendage in each sinus.	As in *insignis*, but smaller.
Corolla. Gamopetalous, rotate-campanulate, 5–partite. White hairs on the upper surface at the base. Petals broad, blunt and overlapping.	Gamopetalous, smaller than in *insignis*, funnel-shaped, 5–partite. White hairs on the upper surface at the base. Petals usually narrow blunt and not over-lapping.
Nectaries. On the upper surface opposite to and at the base of each petal they are deeply depressed and show as raised areas on the under surface of the corolla. They are formed by a pleat in the corolla and the two edges (or scales) of the pleat though not fused completely over-arch.	As in *insignis*, but not so deeply depressed, no raised areas on the under surface.

N. atomaria.	*N. integrifolia.*
Erect when young, later prostrate. Plant is lighter and brighter green than in *integrifolia, insignis, liniflora.* Plant larger than *liniflora.*	Erect when young, later may become prostrate.
As in *insignis,* but thicker, more succulent and brighter green.	As in *insignis.*
Only present at the apices of the stem near the flower buds.	Only present at the apices of the flower stalk.
As in *liniflora.*	Usually not adpressed on the stems and pedicels, but sometimes directed in a downward direction. The whole plant is hairy.
Usually 1–2 times as long as broad. Lobing regular, not so deep as in *insignis,* 3–5 pairs of lobes. Lobes rounded, rarely subdivided. Leaf without white or black spots or blotches.	Usually 1½ to 3 times as long as broad. Lobing deep regular. Lobes usually bearing lobules only on the anterior margin and usually only one lobule to each lobe. Large white spots on the upper surface.
Arrangement as in *insignis,* but smaller and sepals narrower, lighter green and more bluntly pointed than in *insignis* or *liniflora.*	As in *liniflora.*
Gamopetalous, smaller than in *insignis,* rotate, 5–partite. White hairs on the upper surface at the base. Petals broad, blunt and over-lapping.	Gamopetalous, rotate - pateriform, 5–partite. White hairs on the upper surface at the base. Petals usually narrow, blunt and not over-lapping.
As in *insignis,* but not depressed and nectaries open and not over-arched.	Widely open in older flowers. The pleats very hairy, the so-called scales with a free, acute, upwardly directed portion.

N. insignis.	*N. liniflora.*
Androecium. Filaments white, glabrous, anthers brown when young, black after dehiscence. Anthers introrse, attachment versatile. Pollen white. Stamens epipetalous alternating with the petals.	As in *insignis.*
Gynoecium. Style and ovary covered with short hairs. Style bifid at the apex. Stigmatic surfaces black, rounded when receptive.	As in *insignis*, but stigmatic surface brown when young, black or bluish and rounded when receptive.
Flower. Axillary, pedicel long and erect.	As in *insignis.*
Capsule. Pedicel reflexed after fertilisation and the capsule is held inverted till it dehisces. Dehiscence by a single central split into two valves. Seeds 8–10, irregular in shape, rounded, brown and wrinkled. A well-marked white or pale brown caruncle marks the point of placentation.	As in *insignis.*
Flower colour. " Eye " (central area of the corolla) never spotted or coloured. Rim of the petal never white except in a wholly white flower. *Colours observed* :—deep blue, pale mauve, white.	" Eye " either spotted or solid black, except no spotted eye exists in the white flowered forms. Colour always much deeper at the veins, pale blue, purplish blue, white.
Maturity. Comes into flower much later than *atomaria* or *liniflora* if sown at the same time.	Comes into flower before *insignis* or *atomaria* if sown at the same time.

N. atomaria.	*N. integrifolia.*
As in *insignis.*	As in *insignis*, but filaments purplish at base.
As in *insignis*, but stigmatic surfaces brown or white and rounded when receptive.	As in *insignis*, but stigmata black when young and blue and rounded when ripe.
As in *insignis.*	As in *insignis*, but pedicel short.
As in *insignis.*	As in *insignis.*
Rim of the petal white, never coloured. Colour may be solid or in the form of spots, stripes or mottles; reddish black, red, brownish white, slatey blue to purplish blue. No pure white has ever been seen.	Deepest and bluest colour at periphery of corolla but traces of colour throughout. Hairs at base of corolla look purple to the eye because of pale purple background but are white under microscope, long and coarse; 3 to 5 nearly black spots at base of each lobe.
Comes into flower after *liniflora* and before *insignis* if sown at the same time.	

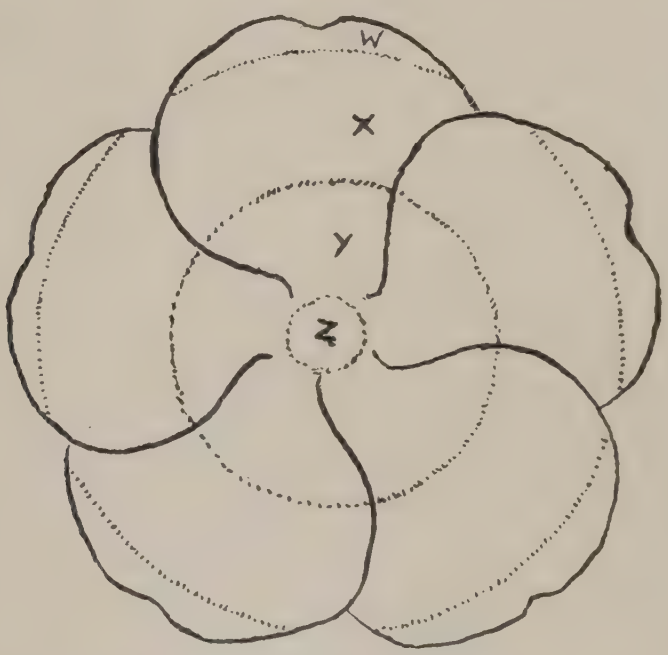
On the upper surface of the corolla the distribution is as follows:—

Zone z is white in all except *integrifolia*. The distribution of colour in the other zones varies in the different groups :—

N. insignis.—In other than pure white-flowered forms zone y is always white, zones x and w are not differentiated the one from the other and are blue or mauve. The flower is never spotted or striped with colour.*

N. liniflora.—In other than pure white-flowered forms zone y is full black or spotted with black, zones x and w are not differentiated from each other and are pale blue, purplish-blue to purple or white.†

N. atomaria.—No pure white form has been observed. Zone w is colourless in all varieties, zones x and y are not distinct from each other except in two varieties (*auriculata* and *marmorata*) and may be spotted with black, or uniformly slatey-blue to bluish-purple, reddish-black, bright red, or faint brownish-white. The two exceptions are:—variety *auriculata* in which zone y bears separate stripes of reddish-black or bright red, and zone x is white; variety *marmorata* in which zone y is mainly of a faint brownish-white and zone x is mainly of a reddish-black or bright red colour.



* In normal flowers the colour is never in the form of stripes or spots, but an irregular mosaic type has been observed in which zones x and w show varying proportions of blue and white. The distribution is not regular and may vary from flower to flower or from petal to petal. Such unstable forms are only to be compared with types showing mottled and irregular sectorial variegation of the foliage.

† In *liniflora* an otherwise white flower may have a full black zone y, yet no white-flowered type has yet been observed in which zone y is spotted with black.

N. integrifolia.—Only one colour variety has so far been seen. The distribution is nearly as in *N. liniflora*, zone y being spotted with black and zones x and w not definitely differentiated from each other and pale purplish-blue, but zone y is of a pale purple colour which extends right up to the corolla base.

Further points of interest in the distribution of the flower colour in these types are:—

1. In all flowers of *liniflora* and *atomaria* where spots or stripes occur on the flower they follow the lines of the veins.

2. In *N. liniflora* the tissue in the immediate vicinity of the veins is always a region of more intense colouration; and coloured flowers, particularly the paler varieties, present a strongly veined appearance. In *N. atomaria* the same tendency is noticeable in some varieties but is not readily visible except when the flower is placed between the source of light and the observer. In *N. insignis* there is no appreciable deepening of colour near the veins.

3. *N. australis* differs from the other varieties in having a very marked deepening of the colour at the periphery of the petals. This is sometimes to be observed in varieties of *N. liniflora* but is in these cases, as far as our observations go, a temporary fluctuation.

As F2 and backcross data are only available for two crosses, (e.g. *N. liniflora* var. *crambeoides* ♀ x *N. liniflora* var. *atrocoerulea* ♂, and its reciprocal and for *N. atomaria* type ♀ x *N. atomaria* var. *discoidalis* ♂ and its reciprocal) it would be premature to advance any definite scheme for the inheritance of colour and pattern in these species of *Nemophila*. The general statements below rest on the evidence of reciprocal F1 s between all varieties and on the F2 and backcross data already available.

In *N. insignis* in zones x and w blue is dominant to mauve and white; mauve and white crossed together give a blue F1.

In *N. liniflora* in zones x and w pale colours are dominant to deep colours; colour is dominant to white, though the white may carry the dominant colour-modifiers. In zone y colour in the form of spots is dominant to full colour.

In *N. atomaria* in zones x and y colour in the form of spots is dominant to striped colour in zone y only. The var. *marmorata* is recessive to all uniformly coloured types except the "ghost" variety in which zones z and y are of a uniform brownish-white.

As a result of breeding trials it was found that:—

1. *N. aurita* and *N. maculata* would not cross either way with any other type or with each other.

2. Within the so-called species *Menziesii* it was found that the four previously described groups were completely unable to cross with each other or with any other species.

3. The varieties within each of these four groups of *N. Menziesii* sensu Brand were fully fertile when crossed with another

variety of the same group, forming hybrids whose segregation in later generations was normal.

On the grounds of the complete sterility existing between these four groups of *N. Menziesii* sensu Brand combined with their morphological differentiation it appears unreasonable to regard them all as varieties or sub-species of the same species. It is proposed therefore to dispense with the name *N. Menziesii* and to accept each of its four component groups as species under the names *N. insignis* Doug., *N. liniflora* Fisch. & Mey., *N. atomaria* Fisch. & Mey. and *N. integrifolia* Abrams.

II.—THE GAMBLE HERBARIUM

In May last the late Mr. J. S. Gamble handed me a document in which he had set out the history of the Herbarium he had built up during his long life, and expressed to me the desire of himself and Mrs. Gamble to present this magnificent collection to the Nation and that it should be kept in the Herbarium of the Royal Botanic Gardens, Kew. The details of this valuable presentation are given in the letters which follow and in Mr. Gamble's document.

A portion of the collection was received from Mr. Gamble on July 14th. The remaining portion, which Mr. Gamble retained at Liss in connection with his work on the Madras Flora, was received on December 1st, 1925, from Mrs. Gamble.

In addition to the Phanerogamic specimens, Mr. Gamble also made large collections of Mosses, Hepaticae and Lichens during his service in India, and after his retirement he turned his attention to the British Bryophyta, and these collections are included in the presentation.

The whole collection is now stored in the Herbarium in Mr. Gamble's own cases and is available for study. The specimens will be incorporated in the General Herbarium as soon as may be possible, in accordance with Mr. Gamble's wishes.

Mr. Gamble also presented to Kew his very valuable and interesting collection of hand specimens of Indian timbers, which have been placed in No. 4 Museum, where they are available for study by Forestry students. In addition, Mrs. Gamble has presented a selection of botanical books to the Library, some of which are of special value as they contain Mr. Gamble's careful annotations.

A. W. H.

"*May* 10*th*, 1925. "Royal Botanic Gardens, Kew.

"My dear Gamble,

"I have read the story of your Herbarium with very great interest and I hope one day you will allow me to publish it with fuller details as to its contents.

"Now comes the important matter, to which you refer in the last few lines. If you really desire to present your valuable collection to the Nation, to be kept at Kew, then I have no hesitation

in saying how much I, personally, should welcome the gift, and the Ministry, I know, would appreciate it fully.

"As you do not express a desire that it should be kept separate, the reception of the collection should present no great difficulty, though, as you know, cabinet accommodation in the herbarium is now becoming a serious matter.

"You do not say whether you would like to present some of the collection during your lifetime—which I hope may long continue—but should such a proposal be in your thoughts I fancy we could make arrangements in consultation with you that would be agreeable to you.

"I will not write more now, as obviously many matters must be discussed with you and Mr. Cotton and myself. If I have understood your meaning correctly I can only conclude with an expression of my very deep appreciation of your kindness and generosity.

"I am, etc.

"(Sgd.) ARTHUR W. HILL."

"*May 22nd*, 1925. "Highfield, East Liss,

"My dear Hill,

"I am very much obliged to you for your kind letter of May 10th, written after you had read the brief story of my Herbarium, and I am very glad indeed to think that the Kew Herbarium would welcome it as an addition to the public collection. I write therefore to offer it to you formally as a gift to the Nation to be added to the Herbarium at Kew and disposed of there as you and the Keeper think best. If it is incorporated in the regular collection and duplicates are found, I should like such of them as you may not want to be offered to the Department of Botany at the Natural History Museum and to any others of the public collections in this country.

"On hearing from you of its acceptance formally, I should like to ask that I may retain, on loan, for my present use in the preparation of the Madras Flora, most of the specimens of the *Monochlamydeae* and Monocotyledons, but all the rest, including the ferns and mosses, would be at once available and could be moved to Kew as you may arrange.

"As I think you have seen, most of the specimens are in pigeonhole boxes, in which they can be moved straight away, but some of them may have to be taken out and made into bundles so that I can keep the boxes which will be very useful to me during the progress of the work on which I am engaged. The ferns, *Cupuliferae* and some others that are not likely to be wanted for my Flora are packed in cases and can be removed at once.

"I am, etc,

"(Sgd.) J. S. GAMBLE."

"*27th May*, 1925. "Royal Botanic Gardens, Kew.

"My dear Gamble,

"Many thanks for your letters of May 22nd. Your letter offering your Herbarium to Kew is exactly what I wanted and my delay

in answering you is due to the fact that I am having all the documents typed to send up to the Ministry of Agriculture.

"I can and do, as Director of Kew, accept your gift with most grateful thanks, and no doubt you will receive an official letter from the Ministry in the course of a few days.

* * * * * * *

"I think you know that I am in no hurry to deprive you of your collections, but only wish to meet your own views with regard to the transfer of such portions of your collection as you feel you no longer wish to keep at Highfield.

"(Sgd.) ARTHUR W. HILL."

* * * * * * *

HISTORY OF THE COLLECTION.

"I began collecting when a student at the French National Forest School at Nancy in 1869–1871 where we all had to submit Herbaria, but in addition to the Herbarium of woody plants sent in, I also collected all kinds chiefly in early morning walks in the country. I named my specimens as far as possible with the help of Grenier and Godron's "Flore de Lorraine." In vacation time and on other visits abroad I also collected in Switzerland and South Germany also in North Italy. I left my specimens at home when I went to India and added to them a small collection made by my father, somewhere about 1830, probably in Italy. He was a Naval Surgeon, Harpur Gamble, M.D. Edin. They were all afterwards mounted and added to the Indian collections.

"My first province in India was Burma, but I collected little there as my station was on the river bank among rice fields and not very near the forests. On my transfer to Bengal I was posted to the Darjeeling Forests and then I started regular collecting, at first chiefly of trees and shrubs for the preparation of my Darjeeling List which was published by the Bengal Government. My friend, Sulpiz Kurz, then Curator of the Calcutta Herbarium, helped me very largely with the naming and Dr. (later Sir George) King the Superintendent of the Calcutta Gardens mounted for me my chief set in exchange for the gift of my second set. I continued to collect as opportunity offered, all kinds later on, with the help of a Lepcha collector whom I employed privately and who did splendid work for me. All specimens collected were roughly named and numbered, dated and localised, almost every day, in the evenings. I was in the Darjeeling and Jalpaiguri Districts from 1872 to 1877 with one short visit to Allahabad and another to the Simla Hills where I added a great many new specimens. In 1877 I was transferred to Head Quarters and again collected about Simla chiefly in company with Major (later Sir Henry) Collett and Mr. H. F. Blanford, F.R.S., the Meteorologist. I was also given two considerable collections from the hills of Chamba made by Mr. B. H. Baden-Powell, B.C.S., and Mr. Robert Ellis, Forest Officer. In 1879

I returned to Bengal as Conservator of Forests and my tours took me to other parts of the Province, the Sunderbans, Dacca, Chittagong, Chota Nagpore, Sonthal Parganas and Orissa so that I was able to add largely to the Herbarium and to publish lists of the Forest vegetation of nearly all. I also had the great benefit, on several excursions, of collecting in company with Mr. C. B. Clarke, F.R.S. In 1882 I was transferred to Madras and took my Herbarium with me. I was able to add to my collections in all the Districts in which I travelled as Conservator of the Northern Circle, arranging and naming them at times when I could consider myself "off duty". I was helped with specimens by many Madras Forest Officers and I received many good ones from Mr. W. A. Talbot from the Bombay Presidency and later from Mr. Lace from Burma, Baluchistan and elsewhere. The Herbarium had then grown to some size and was getting rather unwieldy but I moved it up to Dehra Dun when I was transferred in 1890 to the North-Western Provinces and the charge of the Forest School. It remained at Dehra Dun till I retired and brought it home in 1899. While in the N.-W. Provinces I was able to make good collections in the Dun and the Hills of Jaunsar and Tehri-Garhwal right up to the glaciers of the Upper Tonse Valley. Mr. J. F. Duthie, then in charge of the Saharanpur Gardens, who had also been my companion on many tours, gave me many specimens of his collecting in various parts of Northern India and friends like Mr. C. G. Rogers, Pundit Keshvanand and Rai Bahadur U. N. Kanjilal added many of value. At one time I lost, probably in transit, a few specimens, chiefly ferns, Euphorbias and Oaks. The distribution of my own collections was made regularly from the very beginning. After the first set which I kept, the next, as already stated, went to Calcutta, the rest to Saharanpur or Madras or Dehra Dun, also some to the British Museum at the request of Mr. Carruthers and others to friends like Mr. Talbot and Mr. C. B. Clarke. The only ones that reached Kew were those I gave to Mr. Clarke, as Sir Joseph Hooker had always said that direct gifts were not wanted. I was not very surprised as I knew that he had even refused collections from Sir G. King and the Calcutta Gardens. I expect that the real reason was the want of room at that time. I should mention that while on a short visit to the Cape of Good Hope in 1890 I collected a good deal in the neighbourhood of Cape Town, heaths especially. After my retirement in 1899 from Indian Service, I was able to add to the collection specimens of the British Flora and also many collected in travel on the Continent, in Switzerland, Italy, Sardinia, Malta, Gibraltar, also in South Norway. I also received many specimens from Mr. H. C. Levinge, Mr. H. F. Blanford and others. I have always dried good specimens from my own and other gardens to help in naming what my friends submit to me. I should mention that Dr. H. Christ, of Basel, was good enough to give me a number of valuable Swiss and other specimens. The whole collection, which the late Sir G. King who knew it well referred to in his address to Section K

at the Dover Meeting of the British Association in 1899 as "probably the largest collection of plants ever owned in India," numbers, at a guess, perhaps 50,000 sheets, and its eventual destination is a subject that my wife and I are now seriously considering. It is not fully representative enough to stand by itself for purposes of study and it is very likely that its best use will be to supplement existing collections. We do not wish it to leave this country or be sold, but before deciding anything we should like advice on the question.

"(Sgd.) J. S. GAMBLE.
May 3rd, 1925."

"The Mosses and Hepaticae consist of my own collection and the duplicates of his that Mr. J. F. Duthie gave me. We had collected many of them in company. The naming was done for me, so far as it was completed, by Dr. Brotherus of Helsingfors and Mr. Boswell of Oxford. Their respective handwritings can be very easily recognised. I was always interested in Mosses but official duties and the collection and study of Phanerogams made it impossible to work at them in India. But when at home on furlough in the years 1896-97, I was living at Guildford and began to make my British Collection and to work out the names with the help of 'Dixon and Jameson' and 'Braithwaite,' indispensable books. When I retired from Indian Service and came home, I had first the work of the Paris Exhibition of 1900 and then Sir G. King asked me to join him on the 'Malay Materials.' That work was followed by the 'Madras Flora' which I was asked by the Secretary of State for India (suggested, most likely, by the Government of Madras) to undertake, so that I had to give up any idea of continuing the interesting study of Mosses. I hope that some of my collections may be of value. I think they are all accurately localized geographically.

"I am also sending the 'numbering' books (a mss numerical list in ten books) which belong to the Gamble Herbarium. They have special lists also of the Ellis, Collett and Baden Powell Collections.

"(Sgd.) J. S. GAMBLE.
"*20th July*, 1925."

"Secretary,

"I beg to enclose some very interesting correspondence I have had with Mr. J. S. Gamble, C.I.E., F.R.S., late of the Indian Forest Service, who is working at the present moment on the Flora of Madras for the Government of India. Mr. Gamble is a constant visitor at our Herbarium and we are indebted to him for many valuable presents in the past.

"You will see on reading the story of his Herbarium that he wishes to present his Herbarium to Kew and after a conversation with him, on receipt of his memorandum (Enclosure No. 1) entitled 'Gamble Herbarium' I wrote to him on May 10th, and enclose a

copy of my letter (Enclosure No. 2). Mr Gamble replied to that letter on May 22nd (Enclosure No. 3) and I have replied further to that letter on one or two minor points which he raises.

"I have accepted Mr. Gamble's very generous present, and I hope the Ministry will send a formal letter of thanks to Mr. Gamble for this very valuable gift.

"A. W. H.

"The Secretary,

"Ministry of Agriculture and Fisheries." "*28th May*, 1925."

"*6th June*, 1925. "Ministry of Agriculture.

"DEAR MR. GAMBLE,

"I have heard from the Director of Kew that you have presented to the Nation your very valuable Herbarium, and as the responsible Minister, I wish to convey to you the thanks of the Government for your very generous gift. The addition to the Kew Herbarium of your unique collection of specimens will contribute in no small degree to the maintenance of the pre-eminent position which Kew occupies in the world of botanical science. I understand that we have previously been indebted to you for many valuable presents and I wish, on my own behalf and on behalf of the Nation, to express my great appreciation of the generosity and patriotism which has prompted this final mark of your devotion to the cause of Botanical Science and of your keen desire to uphold the scientific fame of our country.

"Yours very truly,

"(Sgd.) EDWARD WOOD.

"J. S. Gamble, Esq., C.I.E., F.R.S.,

"Highfield, East Liss."

III.—THE TREATMENT OF LEPROSY BY VEGETABLE OILS.

The following contribution on Chaulmoogra and Hydnocarpus Oils has been prepared by Dr. T. A. Henry, Director of the Wellcome Chemical Research Laboratories.

The recent history of the successful use of these two oils in the treatment of leprosy begins with the discovery by Sir David Prain in 1901 that chaulmoogra oil is derived from *Taraktogenos Kurzii* King and not from *Gynocardia odorata* R. Br. as had been supposed up to that time. It thus became possible to secure well-authenticated material for chemical investigation.

In 1904, Dr. F. B. Power and his co-workers began the publication of the results of their chemical researches on this subject (Trans. Chem. Soc. 1904, vol. 85, pp. 838, 851; 1905, vol. 87, pp. 349, 884, 896; 1907, vol. 91, p. 557) which, among other

interesting facts elicited, showed that these two oils contain as their principal constituents chaulmoogric and hydnocarpic acids, the first of a new group of acids now known as the chaulmoogric series. These two acids proved to be closely related and to be unique among naturally-occurring fatty acids in having a cyclic structure and in being optically active. These results have been amply confirmed by later investigators and it has also been found that the same two acids occur in other species of *Hydnocarpus*, besides *H. wightiana* Blume and *H. anthelmintica* Pierre originally examined by Power (Brill; Phil. Journ. Sci. 1916, vol. 11, p. 75; 1917, vol. 12, p. 37), and in other genera such as *Asteriastigma macrocarpa* Bd. (Ghosh. quoted by Rock, U.S.A. Dept. Agric. Bulletin No. 1051) and *Oncoba echinata* Oliv. (Goulding and Akers, Proc. Chem. Soc. 1913, vol. 29, p. 197). The latter known as "Gorli" in Sierra Leone contains chaulmoogric but no hydnocarpic acid.

Although both chaulmoogra and hydnocarpus oils had long been known as remedies for leprosy and skin diseases, their value was regarded by medical men as uncertain, and as the oils obtainable were often dirty, rancid and unpleasant and were given by the mouth, it was not unusual for patients to be nauseated by them long before any good effect could be produced. Oral administration has now been almost entirely superseded by injection, and it is to the provision of derivatives of the oils suitable for this improved technique that recent progress in the treatment of leprosy is largely due. Material suitable for injection was available so long ago as 1879 when Moss prepared "Gynocardic acid," which eventually, in the form of "Sodium gynocardate," really a chaulmoogra oil soap, soluble in water, became a commercial article. This name, which still crops up in chemical and medical literature, is an unfortunate reminder of the mistaken view that chaulmoogra oil is derived from *Gynocardia odorata*. Power and his co-workers also prepared water-soluble salts of their pure chaulmoogric and hydnocarpic acids, and, what is more interesting in view of recent developments, methyl and ethyl esters of these acids. Clinical trials were made about that time with some of these products but the results were not striking enough to warrant their introduction into medicine, probably because the trials were not carried on for the long period now known to be necessary to ensure success. The first real advance* on the medical side was made by Sir Leonard Rogers, who began work in India about 1915 (Lancet, Feb. 5, 1916; Indian Journal of Medical Research, 1917, vol. 5, p. 277). He used at first sodium salts of the total fatty acids of both chaulmoogra and hydnocarpus (*H. Wightiana*) oils but eventually got the best results with sodium salts of fractions of the fatty acids rich

* During the last 20 years research on these oils, especially on the bacteriological and medical sides, has been particularly active, and in this note only the results which are of special importance can be referred to. Several of the publications quoted contain selected bibliographies, which will be useful to those who desire fuller information.

in hydnocarpic acid. The latter acid melts at 60° C. and Rogers's best fractions had melting points 57–58° C. and 60–62° C., whereas chaulmoogric acid melts at 68.5° C.

Somewhat later, at the suggestion of the Director of Leprosy Investigation in the Philippine Islands, Professor Dean prepared the ethyl esters of the mixed fatty acids of chaulmoogra oil, i.e., the mixed ethyl esters of chaulmoogric and hydnocarpic acids. With this material, clinical work has been carried on with great success during the last six years (Hollman and Dean, Journ. Cutaneous Diseases, vol. 37, No. 6; McDonald, Journ. Amer. Med. Assoc., 1920, vol. 75, p. 1483, vol. 76, p. 1121; 1921, vol. 78, p. 1470) in the Philippines and elsewhere. In India Muir has used the ethyl esters of *Hydnocarpus Wightiana* oil with equal success, though not perhaps on the large scale that has been possible in the Philippines. Similarly esters made from *H. anthelmintica* oil have been used in Siam and China.

Commenting on the results of all this work, Rogers and Muir (Leprosy: John Wright and Sons, Bristol, 1925, p. 288) say:—

"The improved methods of dealing with leprosy have therefore placed in our hands a simple and effective means of diminishing the disease by providing treatment, under attractive conditions, for early, little or non-infective cases in out patient dispensaries, and more advanced infective types in sanatoria and colonies, only funds and organization being required to bring about a great decrease of the disease in all countries where these advantages can be supplied to a large proportion of the lepers."

The value of chaulmoogra and hydnocarpus oils or of their derivatives having thus been demonstrated, enquiries have naturally been made as to the possibility of using other oils in which acids of the chaulmoogric series have been found. In 1923 Mr. M. T. Dawe, Commissioner of Lands and Forests, Sierra Leone, kindly provided me with a supply of Gorli seed, which as stated above had been shown in 1913 by Goulding and Akers at the Imperial Institute to contain over 45 per cent. of oil, rich in chaulmoogric acid.

The oil was extracted from Mr. Dawe's material in these laboratories and the esters of the total fatty acids prepared. The Director of Leprosy Investigations in the Philippines tried these esters in cases of leprosy but found them unsuitable as a substitute for chaulmoogra esters. This result is surprising in view of the fact that the only difference between Gorli and chaulmoogra esters is that hydnocarpic acid is absent from the former. Both sets of esters contain chaulmoogric acid and the latter acid is so like hydnocarpic acid in constitution that it ought to have the same therapeutic action. As this matter is of considerable theoretical interest and practical importance it is being further investigated, but until this and other similar questions are settled by experimental work it would seem to be advisable to confine attention to the oils from the three species already known to yield satisfactory

products containing both acids, viz., *Taraktogenos Kurzii*, *Hydnocarpus Wightiana* and *H. anthelmintica*.

An interesting side-issue in this connection is a proposal to treat leprous patients by giving them *Taraktogenos* or *Hydnocarpus* seeds to eat. So long as this is done under medical supervision there is probably nothing to be said against it, but the process is so simple that it may appeal to the benevolent layman as a means of assisting sufferers from this disease. It is well to bear in mind therefore that the seeds of all these species so far examined have been found to contain cyanogenetic glucosides, which liberate small quantities of prussic acid when the seeds are ground up in a moist condition, and that the oils they contain are toxic. It is on record, for example, that a Hydnocarpus oil imported into Hamburg in 1911 and used for the manufacture of edible products gave rise to poisoning cases.

All the species referred to above belong to the Natural Family *Flacourtiaceae* and, with the exception of *Oncoba echinata* Oliv. (*Caloncoba echinata* Gilg.) which occurs in Western Tropical Africa, they are trees distributed through the tropical evergreen forests of the East Indies, up to altitudes of 4,000 ft. Our field knowledge of these trees and other allied species we owe chiefly to Dr. J. F. Rock who, in 1919, carried out a survey of the localities in which these trees were reported to grow, and whose observations are recorded in the U.S. Dep. Agric. Bull. No. 1057 of the 24th April, 1922.

Dr. Rock states that so far as he could ascertain the dealers in chaulmoogra oil have never seen the trees in their wild state. Even the native Bengal dealers whom he met in Chittagong had not been in the forests of the Chittagong Hill tracts. They all depend for their supplies on the seeds collected by the jungle people who know them by different native names in different localities. The Burmese name "Kalaw" is applied to more than one species, and as the different species closely resemble each other they are sent to the markets and bazaars under the collective name of Kalaw, where they are bought by the dealers.

So far as Dr. Rock's observations extended these trees do not appear to bear a regular yearly crop but fruit sporadically and sometimes do not bear fruit at all for two years or more. The exact reason of this he was not able to give; he notes, however, that the trees are polygamous and are undoubtedly insect-pollinated.

It does not appear that a sufficient and constant supply of seeds of known identification will ever be able to be obtained from trees in the wild state, and plantations will be necessary if a constant supply of authentic material should be required. The remoteness from any civilised centres of the forests where these trees occur, the dangers from animals and the difficulties encountered in collecting the seeds all emphasise this point.

The following notes on the climate and natural conditions in which *Taraktogenos* occurs are given by Dr. Rock as a guide to prospective planters of these trees. The soil should be of a sandy nature, preferably quartz sand. Perfect drainage is necessary, and undulating or hilly land is preferable. The region should have a distinct rainy season with a pronounced dry season in the winter months, but still with considerable humidity. The winter temperature should not fall below 40° F. *Hydnocarpus* requires slightly different conditions, but all species require well-drained sandy or loamy silt soils and grow best along creek beds or on the banks of streams; all require climates of the tropical evergreen rain forest.

On arrival at the factory the seeds are carefully washed, sun-dried for a day or two, shelled and sorted by hand, and crushed between corrugated rollers. They are then placed to a thickness of about an inch in jute bags about a foot square. Five layers of eight of these bags are pressed at one time. A steel plate is placed above each layer and the whole subjected to hydraulic pressure. The cold drawn oil is collected in tin cans and filtered through ordinary blotting paper. The residual cake, which is still rich in oil and contains about 6 per cent. nitrogenous compounds, is used as a manure on tea plantations and paddy fields.

In the present contribution Dr. Henry draws particular attention to three of the species hitherto under observation, namely, *Taraktogenos Kurzii* King, *Hydnocarpus Wightiana* Blume, and *H. anthelmintica* Pierre. These species come from quite distinct areas, but all are trees occurring in tropical evergreen forests.

The genus *Taraktogenos* occurs in Assam, Burma, Indo-China, Malay and the Dutch East Indies; twelve species are so far known. It seems possible that there is more than one species known under the name of *T. Kurzii* King, and in the following notes the references to the Burmese and Assam plants have been kept separate. The herbarium material, especially that of flowering specimens, is very scanty and the investigation cannot be carried further until additional material has been obtained. The Burmese tree, locally known as "Kalaw," is distributed throughout Burma though Rock states it is confined to localities of no great elevation. It occurs in dense tropical humid forests with lower strata of fern and shrubs and generally grows in the quartz sand in the beds and along the banks of streams, and on loamy flat country subject to inundation during the rainy season. It grows to a height of 40 or 50 ft. developing a strong and vigorous taproot and has a straight trunk and smooth, pale, yellowish-brown bark. The branches are at first at right angles to the trunk but are very flexible and soon droop downwards especially under the weight of the fruits which are borne on the ends of the branches. The general appearance of the tree is pyramidal, not unlike an old fir tree. The fruits are round, not pointed at the apex, of a light fawn colour, minutely granular, velvety-tomentose, and are about the size of a large orange. The

seeds, which are numerous, are irregularly oval and are embedded in pulp. The fruit matures during the rainy season and then falls to the ground, when it is eagerly sought after by bears and monkeys on account of the fruit flesh.

The Assam plant, locally known as "lemtam," occurs at elevations up to 4,000 ft. in the northern half of Assam. It also is to be found in heavy loamy soil on land subject to inundation and often swampy. More often than the Burmese trees it occurs scattered and frequently in company with *Gynocardia odorata*. Its fruit is ridged especially towards the apex and is darker than the fruits of the trees growing in Burma.

In this connection an interesting communication has been received from Mr. Joseph Jones, who states that in December, 1920, he received at the Botanic Gardens, Dominica, two consignments of seeds through the Royal Botanic Garden, Calcutta. One lot appeared to have come from Assam and one from Burma. From these seeds trees of two growth forms have resulted. Those considered to have come from Burma have produced trees with pendulous branches resembling a fir and with light green leaves (Plate III) whilst the Assam seeds have produced trees of compact growth with ascending branches, shorter internodes and dark green leaves (Plate IV). These Dominica specimens have not yet flowered but Mr. Jones, through whose courtesy the illustrations have been supplied, considers they may come into bearing when about 8 years old.

Prof. Craib, in his enumeration of the Siamese *Flacourtiaceae**, merges the genus *Taraktogenos* into *Hydnocarpus* and the species under consideration becomes *H. Kurzii* Warbg. At the same time he recognises a new variety *H. Kurzii* var. *conica* which is distinguished by its oval fruit with a conical apex; the vegetative characters of the herbarium specimens resemble each other closely; the flowers of this variety have not been seen. Although the variety is recorded from Siam Prof. Craib considers that it is likely to occur in Burma as well as the species and that both are included among the specimens cited by King.

It is not possible in the present state of our knowledge to say whether the differences noted by Rock, Jones and Craib concern the same plants, but there appears to be more than one species, variety, or possibly physiological race under the name *Kurzii*.

The genus *Hydnocarpus*, to which the other two species specially mentioned by Dr. Henry belong, is distributed through India, Ceylon, the Andamans, Malay, Indo-China and the Dutch East Indies to the Philippines and New Guinea; thirty-two species have so far been described.

Hydnocarpus Wightiana Bl. occurs in tropical evergreen forests of South-Western India along the western Ghats, from North Kanara to Travancore, and is found up to an altitude of 3,000 ft. and attains a height of from 50 to 100 ft. Its trunk is rather slender, sometimes

* Florae Siamensis Enumeratio, Part 1, 1925, p. 97.

PLATE III.

[*To face page* 22

PLATE IV

To face page 23

fluted, and the bark is pale brown and somewhat rough. Its white flowers appear in March and April and the fruits from about October to December. The latter are from 2 to 4 inches in diameter, slightly angular, and tomentose; the seeds are numerous, obtusely angular and embedded in pulp. Like *Taraktogenos Kurzii* and the following species it is generally to be found growing near water.

Hydnocarpus anthelmintica Pierre, known in Siam as "maikrabao" or "lukrabao," and to the Chinese as "Ta-fung-tze," occurs in Siam and Indo-China up to elevations of 1,000 ft. and is in cultivation at Chiengmai and elsewhere in Siam. It attains a height of 60 ft.; the male flowers appear from January to March, earlier in the year than the female, and perhaps more frequently. The fruits are globose, about three inches in diameter and contain from 30 to 40 seeds. It is generally to be found on the banks of rivers and estuaries where the water table is high.

Although some thousands of plants of these various species have been raised from the seed distributed by Dr. Rock to Honolulu, Washington, the Philippines and Singapore, there are no plantations in bearing from which a reliable supply of seed can be obtained. The only source from which seed can be obtained at present is from native collectors and the origin of such seed is uncertain, but when the trees that have been established in various tropical countries come into bearing in the course of a few years it will be possible to obtain seed of known identity.

The seed quickly loses its vitality and requires to be carefully packed for transmission. The best results so far have been obtained with seed packed in moist powdered charcoal in cotton bags which were wrapped securely in strong oil paper and then in heavy manila paper.

Very little is known at present of this group of plants, which promise to prove of economic importance. Further investigation in the field, additional material for herbarium study and experimental work on plantations are required before their proper value can be appreciated.

IV.—HUMBOLDT AND BONPLAND'S ITINERARY IN COLOMBIA.* T. A. Sprague.

Towards the end of November, 1800, Humboldt and Bonpland left Venezuela for Cuba, where they remained for nearly three months (December 19th–March 15th). After a protracted voyage from Batabano on the south coast of Cuba in a small sailing vessel they finally anchored on March 24th, 1801, off the mouth of the Rio Sinú, on the north coast of Colombia. There they spent two days in botanizing along the banks of the river, finding a wonderful

* For their Itineraries in Mexico and Venezuela see *Kew Bull.* 1924, pp. 20–27; 1925, pp. 295–310.

wealth of palms and many new plants belonging to other families. On March 27th they proceeded to Cartagena, arriving on March 30th after a violent storm, and a narrow escape on shore from some escaped negro slaves (Cimarrones), who rushed out from the neighbouring thickets in the hope of seizing the ship's boat. Three weeks were spent very profitably at Cartagena, and a visit was paid to the curious mud volcanos of Turbaco, described in the fifth chapter of Humboldt's Views of the Cordilleras.

On April 19th, 1801, the travellers left Turbaco for Barrancas Nuevas, where they embarked on April 21st for their 55 days' voyage up the Magdalena River, reaching Honda on June 13th. After a short visit to the mountains of Mariquita in the Central Cordillera, Humboldt and Bonpland returned to Honda and proceeded via Guaduas to Bogotá, where they stayed for three months (July 6th–September 8th). The celebrated waterfall of Tequendama was among the numerous places of interest seen. This and the natural bridge of Icononzo (near Pandi) are graphically desscribed in Humboldt's Views of the Cordilleras, chapters vi. and vii., and in Éduard André's "L'Amerique Équinoxiale" published in *Le Tour du Monde* (1877–1883).

The next stage of the journey was from Bogotá via Fusagasugá and Pandi to Melgar and Espinal in the Magdalena valley, and thence through Ibagué and over the Quindió pass to Cartago, a town of some importance situated in the valley of the river Cauca. At the time of Humboldt and Bonpland's journey the track over the Quindi pass was extremely bad, and the two travellers had to walk the whole way from Ibagué to Cartago, followed by a dozen oxen bearing their instruments, collections and personal luggage. It was much improved, however, about the middle of the nineteenth century, and can now be traversed on mule-back. Perhaps the best known tree of the Quindió mountains, the majestic Wax Palm (*Ceroxylon andicola*), at the time of André's visit (1876) was unfortunately being felled in thousands. Tree ferns, gorgeous passion flowers, Fuchsias, and delicately tinted orchids grew in profusion beneath the ivory-white columns of the palms, lending a rare enchantment to the scene.

Cartago was reached in the beginning of October, 1801, and the route then led southwards along the Cauca valley to Popayan, which enjoys perhaps the most delightful climate of any town in Colombia. The month of November was spent at Popayan, whence excursions were made to the basaltic mountains of Julusuito and the volcano of Puracé. In order to avoid the torrid and fever-stricken valley of the river Patía, the travellers now followed the mountain-route to Pasto via Almaguer. The rainy season had commenced, however, and the passage through a country composed of alternating stretches of dense forest and treacherous morass, and over the icy páramo region which lies above the limit of trees, was full of hardships. Christmas was spent at Pasto, and the travellers then rapidly proceeded on their way to Quito, passing successively the

towns of Túquerres and Ypiales, the celebrated natural bridge of Rumichaca, one end of which is in Colombia and the other in Ecuador, and the towns of Tulcan and Ibarra. Tulcan, which is included in Humboldt's list of localities in the Andes of Pasto, New Granada, is now in Ecuador. Quito was reached on January 6, 1802. The remainder of Humboldt and Bonpland's journey in South America, including their travels in Ecuador and Peru, will be dealt with in a subsequent paper.

The principal sources of information regarding Humboldt and Bonpland's travels in Colombia are enumerated below.

1. Bruhns, K., Alexander von Humboldt, eine wissenschaftliche Biographie (Leipzig, 1872).
   Vol. i., chapters iv. and v., pp. 345–360 (travels in Colombia); Beilagen, pp. 464–466 (chronology of journey in tropical America).
2. Klencke, H., Alexander von Humboldt's Leben und Wirken, Reisen und Wissen, ed. 7 (Leipzig & Berlin, 1882).
   Pp. 156–165 (travels in Colombia).
3. Humboldt, A., Atlas Géographique et Physique du Nouveau Continent (1814–1834).
4. Humboldt, A., Atlas Pittoresque (1810).
   Pp. 9–13, t. 4 (Ponts naturels d'Icononzo) ; pp. 13–19, t. 5 (Passage du Quindiu); pp. 19–23, t. 6 (Chute du Tequendama); pp. 220–221, t. 30 (Cascade du Rio Vinagre) ; pp. 239–241, t. 42 (Volcans d'air de Turbaco).
5. Humboldt, Bonpland et Kunth, Nova Genera et Species Plantarum (Paris, 1816–25).
   Vol. vii. pp. 335–338 (classified list of localities in New Granada); pp. 338–376 (enumeration of plants collected in New Granada, with their localities).
6. Humboldt, A., Views of the Cordilleras (various editions).
   Chapters v. (mud volcanos of Turbaco), vi. (waterfall of Tequendama), vii. (natural bridge of Icononzo), viii. (Quindió Pass), ix. (Rio Vinagre near the volcano of Puracé).
7. André, Éduard, "L'Amérique Équinoxiale" in Charton, *Le Tour du Monde* (Paris), 1877, xxxiv. 1–64 ; 1878, xxxv. 129–224 ; 1879, xxxvii. 97–144 ; 1879, xxxviii. 273–368 ; 1883, xlv. 337–416 (numerous illustrations and maps).
8. Esguerra O., Joaquin, Diccionario Jeográfico de los Estados Unidos de Colombia (Bogotá, 1879).

In the following Itinerary the localities have been arranged as far as possible in the order in which they were visited by Humboldt and Bonpland, with the following exceptions : Melgar and Espinal are included at the end of the other localities in the Magdalena valley, although they were visited three months later ; and the mountains of Mariquita, visited in June, 1801, are placed with the

other places in the Central Cordilleras through which Humboldt and Bonpland passed in September, 1801, after a three months stay in the neighbourhood of Bogotá. Most of the localities may be found on one or more of the maps cited under each section, and the approximate geographical position of the remainder may be ascertained by means of the numerical sequence. Names of places which may be found in a good atlas are printed in black type.

ITINERARY.

Rio Sinú, Cartagena and Rio Magdalena, March–June, and September, 1801.

(*vide* H.B.K. Nov. Gen. vii. 335; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t. 24; André in Le Tour du Monde, 1877, xxxiv. 35, map; 1878, xxxv. 221, map).

1 **Rio Sinú**; 2 El Zapote; 3 Santero; 4 Cerro de San Nicolas; 5 **Santiago** de Tolú; 6 Isla de Barú; 7 **Cartagena**; 8 Cerro de la Popa; 9 Turbaco; 10 Mahates; 11 El Dique de Mahates; 12 Barrancas Nuevas; 13 **Tenerife**; 14 Zambrano; 15 Pinto; 16 **Mompox** (Mompos); 17 Minchiqueo (Menchiquejo); 18 Peñones de Roso; 19 Banco; 20 El Peñon; 21 Tamalameque; 22 El Regidor; 23 Rio Viejo; 24 Morales; 25 Badillas; 26 Cerros de San Lucar; 27 Paturia; 28 La Simitarra; 29 Los Pajarales de Sogamozo; 30 Boca del **Rio Sogamozo**; 31 Bojorque; 32 Barrancas Vermejas; 33 Boca del **Rio Opon**; 34 Caño de Chucuri; 35 Isla de Brujas; 36 Caño de Juancito; 37 Peñon de Barbacoa; 38 Caño de Regla; 39 San Bartolomé; 40 Garrapatas; 41 Peñon de Macuango; 42 Quebrada del Ermitaño; 43 Angostura de Carare; 44 Nares; 45 Brazo de Velasquez; 46 Rio de La Miel; 47 Buenavista; 48 La Egyptiaca; 49 Guarumo; 50 **Honda**; [**Ambalema**: not visited] 51 Melgar, and 52 El Espinal (Sept. 1801).

Eastern Cordilleras: from Honda to Bogotá and neighbourhood, and thence via Pandi to Melgar, June–Sept. 1801.

(*vide* H.B.K. Nov. Gen. vii. 336; Humb. et Bonpl., Voyage, Atlas Géogr. sér. 1, tt. 6, 19, 24; André in Le Tour du Monde, 1877, xxxiv. 53, map; Petermanns Mittheil. 1888, t. 7; Ergänzungsh. No. 104, t. 1).

53 **Honda**; 54 Las Cruces; 55 Salto del Fraile; 56 Alto del Sargento; 57 Guaduas; 58 Cune; 59 Villeta; 60 Mave; 61 El Guayaval; 62 Alto de Gascas; 63 El Aserradero; 64 Alto del Roble; 65 **Facatativá**; 66 Fontibon; 67 Santa Fé de **Bogotá**; 68 Guadalupe; 69 Monserrate; 70 Páramo de Chingasa; 71 Suba; 72 Cota; 73 Tenjo; 74 Chia; 75 **Zipaquirá**; 76 Soacha (Suacha); 77 Chipo; 78 Salto de Tequendama; 79 Páramo de San Fortunato; 80 Fusagasugá; 81 Pandi (Mercadillo); 82 Puente de Icononzo; 83 Quelamana; 84 Picala; 85 Melgar.

Central Cordilleras; Honda to Mariquita and Santa Ana, June 1801; Espinal to Cartago, via Ibagué and the Quindió Pass, Sept. 1801.

(*vide* H.B.K. Nov. Gen. vii. 336; Humb. et Bonpl., Voyage,

Atlas Géogr. sér. 1, t. 24; André in Le Tour du Monde, 1878, xxxv. 221, map; 1879, xxxvii. 99, map; Petermanns Mittheil. 1883, t. 13).

86 Rio Guali; 87 Mariquita; 88 Rio Quama; 89 Santa Ana; 90 Espinal; 91 Rio Luisa; 92 Mesa de Cuello; 93 Contreras; 94 Valle de Combeima; 95 **Ibagué**; 96 Valle de Caravajal; 97 Cuesta de Tolima; 98 La Palmilla; 99 El Moral; 100 El Azufral; 101 Paso de Machin; 102 Quebrada de Toche; 103 Las Cruces; 104 Los Gallegos; 105 Quebrada de Tochecito; 106 La Ceja (La Seja); 107 Los Volcancitos; 108 El Boqueron del Páramo (de **Quindió**); 109 La Garita del Páramo (de **Quindió**). 110 El Inciensal; 111 Quebrada de Boquia; 112 Portachuelo; 113 **Cartago.**

Cauca Valley and Cordillera of Popáyan; from Cartago to Popáyán, Oct. 1801.

(*vide* H.B.K. Nov. Gen. vii. 337; Humb. et Bonpl., Voyage, Atlas Géogr. sér. 1, tt. 24, 25; André in Le Tour du Monde, 1879, xxxvii. 99, 135, maps; xxxviii. 275, map).

113 **Cartago**; 114 El Naranjo; 115 Roldanillo; 116 Tulua; 117 San Pedro; 118 **Buga**; 119 Alegría; 120 **Cali**; 121 Caloto; 122 Quilichao; 123 Rio Pescador; 124 Rio Pindamon; 125 Rio de Palacé; 126 **Popayan.**

Cordilleras of Popayan and Almaguer, Oct.–Nov. 1801.

(*vide* H.B.K. Nov. Gen. vii. 337; Humb. et Bonpl., Voyage, Atlas Géogr. sér. 1, t. 24, inset; André in Le Tour du Monde, 1879, xxxviii. 275, 301, maps).

126 **Popayan**; 127 Cerro de la Emme; 128 Coconuco; 129 Boquita del Volcan de Puracé; 130 Rio Vinagre; 131 Pisojé; 132 Poblazon; 133 Alto del Roble; 134 Timbio; 135 Quilcasé (Quilquasé); 136 La Sequia; 137 Rio Esmita (Smita); 138 Rio Blanco; 139 Valle del Rio Guachicon; 140 Valle del Rio Putes; 141 San Miguel; 142 La Ascension; 143 Páramo de Socoboni; 144 Rio Pansitara; 145 Vega de San Lorenzo; 146 Páramo de Cuyurcu; 147 Paramito de Almaguer; 148 Rio Marmato; 149 Puntaurcu; 150 **Almaguer**; 151 Páramo de las Papas; 152 Valle del Rio Ruiz; 153 Páramo de Pitatumba; 154 Pongo; 155 Valle del Rio Xayo (Jayo); 156 Valle de Sambingo; 157 Páramo de Achupallas.

Cordillera of Pasto, Nov.-Dec. 1801.

(*vide* H.B.K. Nov. Gen. vii. 337; Humb. et Bonpl. Voyage, Atlas Géogr. sér. 1, tt. 5, 22; André in Le Tour du Monde, 1879, xxxviii. 301, 354, maps; 1883, xlv. 339, map).

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V.—ADDITIONS TO THE INDEX KEWENSIS : VII.*

Pierre's Flore Forestière de la Cochinchine was published in 26 fascicles, fascicles 1–25 containing 400 plates with text, and fascicle 26 containing the table of contents, 14 pages, the whole work covering the period 1879–1907. Professor W. G. Craib having drawn the attention of Kew to a few names published in this work and not included in the Index Kewensis, it was considered advisable to go through the whole work with a view to detecting any further omissions. As a result it has been found that 98 names have either been omitted altogether or erroneously entered, 70 of them being from the period covered by the first supplement of the Index Kewensis.

Names not appearing on the plates but mentioned in the text are quoted "sub t." Those published as synonyms are marked "in syn." New combinations are followed by the binary name on which they are based.

M. L. G.

PIERRE, FLORE FORESTIÈRE DE LA COCHINCHINE (1879–1907).

Amerimnon aestivale sub t. 381 (1898) : Dalbergia aestivalis.
,, anomalum sub t. 381 (1898) : Dalbergia anomala.
,, bariense sub t. 380 (1898) : Dalbergia bariensis.
,, cambodianum sub t. 383 (1898) : Dalbergia cambodiana.
,, cochinchinense sub t. 382 (1898) : Dalbergia cochinchinensis.

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* Continued from *Kew Bull.* 1925, 345.

Amerimnon dongnaiense sub t. 382 (1898) : Dalbergia dongnaiensis.
,, Duperreanum t. 381 (1898) : Dalbergia Duperreana.
,, fuscum sub t. 381 (1898) : Dalbergia fusca.
,, mammosum sub t. 380 (1898) : Dalbergia mammosa.
,, saigonense sub t. 381 (1898) : Dalbergia saigonensis.
Ancistrolobus prunifolius *Hort. ex Pierre* sub t. 52 (1882) : Cratoxylon prunifolium.
Anisoptera scaphula sub t. 235 (1890) : Vatica scaphula.
Aphanamixis cochinchinensis t. 343 (1896).—Cochinch.
,, rohituka t. 344 (1896) : Amoora rohituka.
Aquilaria crasna sub t. 385 (1899), nomen.—Cochinch. ; Cambodia.
Bombax anceps t. 175 (1888).—Cochinch.
,, cambodiense t. 174 (1888).—Cambodia.
Buchaniana t. 370 (1898), sphalm. : Buchanania *Spreng.* (Anacardiac.).
Cnemidiscus Thorelii sub t. 320 (1894).—Cochinch.
Columbia angusta sub t. 137 (1888).—Cambodia.
Decaschistia affinis t. 171 (1888).—Cambodia.
,, Harmandii t. 170 (1888).—Anam.
,, Thorelii t. 170 (1888).—Cochinch. ; Cambodia.
Dipterocarpus condorensis t. 214 (1889).—Cochinch.
Elaeocarpus gratissimus *Blume ex Pierre* sub t. 144 (1888), nomen.—Hab. ?
,, leptophanes *Blume ex Pierre* sub. t. 144 (1888), nomen.—Hab. ?
,, polysticus *Blume ex Pierre* sub t. 144 (1888), nomen.—Hab. ?
Epicharis procera sub t. 348 (1896) : Dysoxylum procerum.
,, ramiflora sub t. 348 (1896) : Dysoxylum ramiflorum.
Eriolaena affinis t. 176 (1888).—Cambodia.
Erythroxylon cambodianum t. 282 (1893).—Cochinch. ; Cambodia.
Euonymus calyptratus t. 311 (1894), in syn. : Glyptopetalum calyptratum.
,, chaudocensis t. 310 (1894), in syn. : Glyptopetalum chaudocense.
,, cochinchinensis t. 309 (1894).—Cochinch.
,, gracilipes t. 311 (1894), in syn. : Glyptopetalum gracilipes.
,, Harmandianus t. 310 (1894), in syn. : Glyptopetalum Harmandianum.
,, mitratus sub t. 308 (1894).—Cambodia.
,, stixifolius t. 310 (1894), in syn. : Glyptopetalum stixifolium.
Euphorbia pallens t. 318 (1894).—Cochinch.
Eurycoma cochinchinensis sub. t. 292 (1893), in syn. : E. longifolia var. cochinchinensis *Pierre*.
,, Harmandiana t. 292 (1893).—Cochinch.
Evodia ailantifolia t. 287 (1893).—Cochinch.
,, trichotoma t. 287 (1893) : Tetradium trichotomum.
Fegimanra sub t. 263 (1892), gen. nov. (Anacardiac.).
,, africana sub t. 263 (1892) : Mangifera africana.
Galedupa maritima sub t. 385 (1899) : Sindora maritima.
,, mucronata sub t. 385 (1899) : Sindora mucronata.
Garcinia Vriesiana fasc. 4, p. xxxvi (1882).—Celebes.
Glyptopetalum calyptratum sub t. 311 (1894).—Cochinch.
,, chaudocense sub t. 310 (1894).—Cochinch.
,, gracilipes sub t. 311 (1894).—Penins. Mal.
,, Harmandianum sub t. 310 (1894).—Indo-China (Laos).
,, stixifolium sub t. 310 (1894).—Indo-China (Laos).
Glycosmis cambodiana sub t. 285 (1893).—Cochinch.
,, Harmandiana sub t. 285 (1893).—Cochinch.
,, ovoidea sub t. 285 (1893).—Cochinch.
Grewia brevipes sub t. 153 (1888), nomen.—Hab. ?
,, Roxburghiana *Korth. ex Pierre* sub t. 153 (1888), nomen.—Hab. ?
Hippocratea Chesseana t. 301 (1893).—Cochinch.
Hiptage mekongensis t. 270 (1892).—Indo-China (Laos).
,, triacantha t. 274 (1893).—Cochinch. ; Cambodia.
Ilex excavata t. 279 (1893).—Cochinch.

Koelreuteria arborescens sub t. 322 (1895) : Arfeuillea arborescens.
Lepiaglaia t. 334 (1895), gen. nov. (Meliac.).
,, Bailloni t. 352 (1896).—Cambodia.
,, Montrouzieri sub t. 340 (1896).—Indo-China.
,, pyramidata sub t. 334 (1895).—Cochinch. ; Cambodia.
,, tetrapetala sub t. 337 (1896).—Cochinch. ; Cambodia.
Locandia mekongensis sub t. 262 (1892).—Cochinch.
Luvunga nitida t. 288 (1893).—Cambodia.
Mangifera Rumphii sub t. 364 (1897).—Ins. Molucc.
Nephelium Thorelii t. 320 (1894), in syn. : Cnemidiscus Thorelli.
Pedicellia pentapetala sub t. 324 (1895) : Cupania pentapetala.
Peltophorum rufum sub t. 388 (1899) : Baryxylum rufum.
Pongamia pinnata sub t. 385 (1899) : Caju pinnatum.
Pragmatropa sub t. 309 (1894), gen. nov. (Celastrac.).
,, pendula sub t. 309 (1894) : Euonymus pendulus.
Pragmotessara t. 309 (1894), gen. nov. (Celastrac.).
,, echinata sub t. 309 (1894) : Euonymus echinatus.
,, ilicifolia sub t. 309 (1894) : Euonymus ilicifolius.
,, japonica t. 309 (1894) : Euonymus japonicus.
,, latifolia sub t. 309 (1894) : Euonymus latifolius.
,, theifolia sub t. 309 (1894) : Euonymus theifolius.
Pterocymbium campanulatum t. 195 (1889) : Sterculia campanulata.
,, columnare t. 195 (1889).—Cochinch.
,, dongnaiense sub t. 195 (1889) : Sterculia dongnaiensis.
,, tubulatum sub t. 195 (1889) : Sterculia tubulosa.
Salacia kamputensis t. 312 (1894).—Cambodia.
Sapindus anamensis t. 317 (1894), in syn. : Pavieasia anamensis.
Shorea attopoënsis t. 232, 257 (1890–92).—Indo-China (Laos).
,, saigonensis t. 257 (1892).—Cochinch.
,, tomentosa *Hort. Bogor. ex Pierre* sub t. 225 (1890), in syn. : Pentacme siamensis var. suavis *Pierre*.
Unona evecta t. 31 (1880).—Indo-China.
,, suberosa sub t. 31 (1880), nomen.—Hab. ?
Ventilago fascigera t. 314 (1894).—Cambodia.
Xerospermum Thorelii t. 320 (1894), in syn. : Cnemidiscus Thorelii.
Zizyphus Harmandii t. 316 (1894), sphalm. : Z. rugosa var. Harmandi *Pierre*.
,, hoaënsis t. 315 (1894).—Cochinch.

VI.—LINDEN AND PLANCHON'S PLANTAE COLUMBIANAE. T. A. Sprague.

An account of the Botany of J. Linden's third expedition to tropical America, by J. Linden and J. E. Planchon, was printed in 1863*. According to Urban† the work was never publicly issued, but about the years 1874–75 Prof. A. Cogniaux, with J. Linden's permission, had five copies put together from the clean sheets, one for J. Linden, a second for the Botanic Garden, Brussels, and the remaining three for E. Marchal (Brussels),

* Troisième Voyage de J. Linden, dans les parties intertropicales de l'Amérique, au Venezuela, dans la Nouvelle-Grenade, à la Jamaique et dans l'île de Cuba, executé par ordre du Gouvernement Belge pendant les années 1841 à 1845, et publié sous ses auspices.—Prèmiere partie. Botanique. Plantae Columbianae, par J. Linden et J. E. Planchon. Tome Ier. (Bruxelles, 1863.)

† Symb. Antill. iii. 78, footnote (1902).

E. Fournier (Paris), and I. Urban (Berlin) respectively. J. E. Planchon probably possessed only proof-sheets. Urban considered that the new species described in this work were effectively published. The view might be taken, however, that the distribution of five copies, one to a Botanic Garden, and the remaining four to individual botanists, does not constitute "public distribution" under Art. 35 of the International Rules.

The work is not mentioned in Pritzel's Thesaurus, ed. 2 (1872), but is included in the Catalogue of the Library of the Arnold Arboretum, vol. i. p. 429 (1914). A copy, formerly in the possession of the late Édouard André, was acquired by Kew in 1921. In view of the very great rarity of the volume, and the large number of new species described in it, the following account may be of interest.

The Introduction includes a sketch of the Physical Geography and Climatology of Colombia and Venezuela (pp. i–xxxvi), and a historical summary of the Botanical Exploration of those countries (pp. xxxvii—lxiv). It is followed by an appendix on the distribution of the seasons in the different provinces of Venezuela (pp. lxv–lxviii) and a series of tables dealing with the provinces and cantons of Venezuela and Colombia, and the altitudes, average temperatures and geographical positions of the principal localities and mountains (pp. lxix–lxxxviii).

The remainder of the volume (pp.1–64)—which ends abruptly in the middle of a sentence—is devoted to an enumeration of plants from Colombia and Venezuela, collected for the most part by Linden, Funck and Schlim. It includes descriptions of about fifty new species. Some twenty of these were published in advance by Triana and Planchon in the first three parts of their Prodromus Florae Novae-granatensis.* *Monnina meridensis* Planch. et Linden was published by Weddell in his Chloris Andina, ii. 268 (1857–61). Gürke† took up *Malvaviscus elegans* Linden et Planch. and *M. speciosus* Linden et Planch. from the "Plantae Columbianae," and cited *M. glabrescens* and *M. Funckeanus* as synonyms of *M. oligotrichus* and *M. cuspidatus* respectively; Triana and Planchon‡ cited *Abutilon aurantiacum* Linden et Planch. as a synonym; and Urban § reproduced the description of *Sauvagesia Brownei* Planch. The remaining twenty-five species appear to have been overlooked, both by monographers and by those concerned with the floras of Venezuela and Colombia. Ten of them do not appear to have been described under any other names, either before or since the year 1863. Two, *Arenaria humifusa* and *Cerastium meridense*, were redescribed as new species in 1911 by Briquet from *the same type-numbers* under the

* Ann. Sc. Nat. sér. 4. xvii. 5–190, 319–382 (1862); xviii. 258–381 (1862).
† Mart. Fl. Bras. xii. pars. 3, 536–540 (1892).
‡ Ann. Sc. Nat. sér. 4, xvii. 182, footnote (1862).
§ Symb. Antill. v. 430 (1908).

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names *Arenaria venezuelana* and *Cerastium venezuelanum* respectively.* Ten were described as new species under different names prior to 1863, with citation of *the same type-numbers*. The remaining three, *Cissampelos pannosa*, *Berberis nutans* and *Luehea nobilis* also appear to be synonyms of previously described species.

Unknown to Linden and Planchon, the Russian botanist, Turczaninov, had in the years 1854 and 1858 described many new species from Venezuela and Colombia, eleven of them being actually based on material bearing the same collector's numbers as species described in the "Plantae Columbianae." When Triana and Planchon prepared the first part (published in 1862) of their "Prodromus Florae Novae-granatensis" they were aware, however, of Turczaninov's second paper, but apparently not of his first: thus they took up *Malvaviscus oligotrichus* Turcz., *Luehea endopogon* Turcz., and *Saurauja brachybotrys* Turcz. (all published in 1858), but did not account for *Berberis psilopoda* Turcz., *Viola Lindeniana* Turcz., *Securidaca dasycarpa* Turcz., etc. (published in 1854). If, as seems probable, Linden and Planchon subsequently became aware also of Turczaninov's first paper, they would have discovered that he had forestalled them in describing about thirteen of their new species, and this discovery may have induced them to withhold the "Plantae Columbianae" from publication.

The following commentary on the "Plantae Columbianae" includes (1) reductions of thirteen species and one variety; (2) less certain reductions of four species; and (3) reproductions of Linden and Planchon's descriptions of fifteen species which do not appear to have been described by previous authors, and of the four species mentioned under heading (2).

In reproducing Linden and Planchon's text a few minor typographical alterations have been made in order to bring it more into line with modern practice. The numerous editorial notes are distinguished by being enclosed in square brackets.

Anonaceae.

Xylopia Dunaliana *Planch. et Linden* ex Triana et Planch. Prodr.† 37 (1862), in syn.; Linden et Planch. Pl. Columb. 5 (1863), descr.

Foliis breviter petiolatis anguste oblongis (12-18 cm. longis) sensim acuminatis basi obtusiusculis margine integro revolutis supra glabris nitidis subtus (junioribus praesertim) pube adpressissima rufo-sericea indutis demum subglabratis, cymis axillaribus abbreviatis subsessilibus 2–4-floris, pedicellis brevissimis medio bractea semicucullata obtusissima stipatis, calyce cupuliformi repando 3-dentato denum plus minus irregulariter fisso sericeo-pubescente, petalis exterioribus e basi ovata linearibus intus rufo-

* Ann. Conserv. & Jard. Bot. Genève, xiii & xiv. 381, 383 (1911).

† Throughout the present paper references are given to the separately paged reprint of Triana and Planchon's Prodromus, as this is much more convenient to consult than the Annales des Sciences Naturelles, in which the Prodromus was published by instalments.

sericeis interiora pruinoso-albida superantibus, carpellis abortu 2–5 stipite eis duplo breviore sustentis oblongis vix curvulis a lateribus compressiusculis glaberrimis superficie rugosis indehiscentibus, seminibus 6–9 uniseriatis compresso-ovoideis, testa nitida nigricante, arillo e lobis 2 discretis carnosis albidis utrinque ad basim seminis testae adnatis 3 mm. longis constante.— *Unona xylopioides* Dunal, Anon. 117, tab. 24 ; H.B.K., Nov. Gen. v. p. 62. *Xylopia grandiflora* Seem., Bot. of Herald, non A. St.-Hil. Vulgo : Fruto de Burro ; Zembi, à Mariquita ; Achon, dans les llanos de San Martin.

Venezuela. Montalban (prov. de Carabobo), Juin 1846, *Funck & Schlim*, no. 655.

Nouvelle-Grenade. Ocaña, *Schlim*.

Espèce très-voisine du *Xylopia grandiflora* A. St.-Hil. dont elle se distingue aisément à sa pubescence très-courte, bien couchée, au lieu d'être molle et veloutée. Les fruits sont aussi plus gros et plus longuement stipités.

[Included under *X. longifolia* A. DC. by Triana and Planchon l.c.]

Menispermaceae.

Cissampelos pannosa *Linden et Planch.* l.c. 7.

Caulibus erectis strictis crassiusculis dense foliosis, foliis breviter petiolatis ovato-orbiculatis (non peltatis) 5–6 cm. longis basi subcordatis apice rotundato vel obtusiusculo mucronatis leviter repando-crenatis 5–7-nerviis crassis utrinque pannosis supra rufis subtus rufo-incanis, racemis foemineis axillaribus breviter pedunculatis folii dimidium circiter aequantibus, bracteis imbricatis brevissime petiolatis cordatis membranaceis incano-villosis, floribus 4–6 simul fasciculatis breviter pedicellatis, pedicellis dense ovariis parcius hispidis, stylo brevi apice tridentato, fructu obovoideo compresso circiter 6 mm. longo obtuse tuberculoso villoso.

Venezuela. Guanaguana, Caracas, ann. 1843, *Funck*, no. 171.

Assez semblable au *Cissampelos subtriangularis* A. St.-Hil., mais à feuilles plus tomenteuses, surtout à la face supérieure, à racèmes plus grands, etc.

[Antedated by *C. pannosa* Turcz. (1854), from Cuba. Neither of these species appears to be mentioned by Diels in Engler's Pflanzenreich, Menispermaceae, but *Funck* 171, the type-number of *C. pannosa* Linden et Planch., is cited by Diels (l.c.296) under *C. ovalifolia* var. *vestita* (Triana et Planch.) Diels.]

Berberidaceae.

Berberis nutans *Linden et Planch.* l.c. 8.

Spinis 5–partitis, foliis congestis brevissime petiolatis anguste oblongis (4–6 cm. longis, 15–20 mm. latis) basi acutis apice saepius obtusis margine revoluto integris vel hinc inde exserte denticulatis coriaceis glabris supra nitidis subtus glaucis reticulato-venosis, paniculis amplis pedunculatis foliis pluries longioribus nutantibus

multifloris, rachibus pedicellisque puberulis, floribus amplis pedicellatis glabris flavis.

VENEZUELA. Paramillo de Agua de Obispo (prov. de Truxillo), alt. 2870 m., *Linden*, no. 306 ; Sierra Nevada de Merida, alt. 3575 m., *Schlim*.

Très-belle espèce, rapprochée par l'inflorescence du *Berberis quindiuensis*. Elle s'en distingue au premier abord par ses feuilles plus petites, presque toujours entières et non bordées de nombreuses dents épineuses, glauques en dessous, etc. L'échantillon no. 306 n'est rapporté ici qu'avec doute. Il diffère du type par ses grappes simples, à peu près dressées. Mais ces grappes n'étant qu'en bouton, il se pourrait qu'elles dussent se courber pendant l'anthèse.

[The type of *B. nutans* is Schlim's specimen from the Sierra Nevada de Merida. The description suggests *B. discolor* Turcz. (1854), which was based on *Funck & Schlim* 1124, from the same region.

Linden 306, from Truxillo, which was cited doubtfully under *B. nutans*, has been referred to *B. truxillensis* Turcz. by Schneider in Bull. Herb. Boiss. sér. 2, v. 807.]

Berberis tolimensis *Planch. et Linden* ex Triana et Planch. Prodr. 52 (1862) ; Linden et Planch. l.c. 9.

[Founded on *Linden* 912, the type-number of *B. psilopoda* Turcz. (1854).]

Berberis densa *Linden et Planch.* l.c.

[Treated as a variety of *B. rigidifolia* H.B.K. by Triana and Planchon Prodr. 54, and as a variety of *B. globosa* Benth. by Schneider in Bull. Herb. Boiss. sér. 2. v.805.]

Berberis lycioides *Linden et Planch.* l.c.

[Based on *Funck & Schlim* 754, the type-number of *B. truxillensis* Turcz. (1854).]

CRUCIFERAE.

Cardamine pulchra *Linden et Planch.* l.c. 12

[Founded on *Funck & Schlim* 1542, the type-number of *C. punicea* Turcz. (1854). O.E. Schulz in Engl. Jahrb. xxxii. 420 treated *C. punicea* as a variety of *C. Johnstonii* Oliv.]

Cardamine pulchra var. **pallida** *Linden et Planch.* l.c.

[Based on *Funck & Schlim* 1554, which is the type-number of *C. nevadensis* Turcz. (1854). O.E. Schulz, l.c. 422, treated the latter as a variety of *C. Jamesoni* Hook.]

Cardamine lanceolaris *Linden et Planch.* l.c.

[Based on *Linden* 1416, the type-number of *C. armoracioides* Turcz. (1854), which is maintained as an independent species by O. E. Schulz, l.c. 409.]

Draba farsetioides *Linden et Planch.* l.c. 13.

Tota pube stellato-ramosa cinerascens, radice verticali, caule erecto simplici 20–30 cm. longo haud crasso striato lignescente, foliis infimis ad collum confertis (in specim. florido imperfectis) linearibus integris 3–6 cm. longis, caulinis remotiusculis linearioblongis obsolete dentatis, racemo terminali sessili 8–12 floro conferto, pedicellis flore illum *Diplotaxeos tenuifoliae* aequante vix brevioribus, sepalis oblongis obtusis viridescentibus flavo-marginatis, petalis flavis obovatis calyce paulo longioribus, filamentis subulatis ovarium superantibus, stylo gracili (7 mm. longo) glabro ovarium oblongum dense pubescentem aequante, ovulis in loculo quoque circiter 20.

VENEZUELA. Prov. de Merida : Sierra Nevada, alt. 3220 m., août 1843, *Linden*, no. 455.

Draba Funckeana *Linden et Planch.* l.c.

Caudice simplici crasso descendente, caulibus pluribus ascendentibus e centro rosulae foliorum radicalium enatis simplicibus racemo primum conferto terminatis, foliis infimis anguste oblongis basi in petiolum marginatum latum attenuatis remote serratis uninerviis pilis simplicibus ciliatis caeterum glabriusculis, caulinis sat crebris sessilibus obsolete denticulatis, pedicellis sicut rachi pube ramosa cinerascentibus flore magnitudine *Kernerae saxatilis* plus duplo longioribus, sepalis ovato-oblongis, petalis flavis obovatis calycem duplo excedentibus, filamentis subulatis ovario oblongo glabro brevioribus, stylo vix 2 mm. longo ovarii dimidium circiter aequante, ovulis in loculo singulo circiter 6.

VENEZUELA. Prov. de Merida : Sierra Nevada, alt. 3250 m., juin 1847, *Funck & Schlim*, no. 1619.

Par l'ensemble de ses traits, cette espèce se rapproche du *Draba pamplonensis*.

Draba pseudo-Euryops *Linden et Planch.* l.c. 14.

[Based on *Funck & Schlim* 1606 (pro parte). The species is described as having a short style, not equalling the ovary, and a silicle hardly longer than its pedicel. It is evidently identical with *D. pulvinata* Turcz. (1854), which was founded on part of the same number. Gilg and Muschler in Engl. Jahrb. xlii. 475 cited *Funck & Schlim* 1606 under *D. arbuscula* Hook. f., but omitted to cite *D. pulvinata* as a synonym.]

Draba dendroides *Linden et Planch.* l.c. 15.

[Founded on *Funck & Schlim* 1606 (pro parte). The species is described as having a very long style, twice as long as the ovary, and a silicle which is only half as long as its pedicel. It is evidently identical with *Dolichostylis Funckii* Turcz. (1854), which was based on part of the same number. Gilg and Muschler appear to have overlooked the genus *Dolichostylis* Turcz. (*Stenonema* Hook.) in their enumeration of South American *Cruciferae* published in Engl. Jahrb. xlii. 437—487.]

Draba Lindeni *Planch.* in Linden et Planch. l.c.

Frutescens, ramis inferne denudatis dichotome (?) divisis apice foliosis in racemos bracteatos divisis, foliis confertis linearibus integerrimis glabris, racemis 9–24 cm. longis, rachi pedicellisque (24–36 mm. longis) pube ramosa conspersis, floribus amplis magnitudine illorum *Diplotaxeos tenuifoliae* flavis, petalis calyce duplo longioribus, filamentis subulatis, stylo ovarium glabrum pluries excedente, silicula (immatura) anguste elliptica loculis circiter 6–8-ovulatis.—*Leptonema Lindeni* Hook. Ic. Pl. t. 692.
Venezuela. Paramo de Niquitao (prov. de Trujillo), alt. 3570 m., *Linden*, no. 1433, juillet 1843.

Cette remarquable plante, certainement congénère des autres *Draba* d'Amérique, se distingue de la plupart des crucifères par l'existence d'une bractée à la base de chacun de ses pédicelles.

[The genus *Leptonema* Hook., non Juss., was renamed *Dolichostylis* by Turczaninov in 1854, the species becoming *Dolichostylis Lindeni*. In Benth. et Hook. f. Gen. Pl. i. 75 (1862) the genus was renamed *Stenonema* Hook.]

Capparidaceae.

Cleome (Gynandropsis) leptorachis *Linden et Planch.* l.c. 17.

[Founded on *Linden* 1405, and *Funck & Schlim* 1210, on which numbers *Gynandropsis macrophylla* Turcz. (1854) had previously been based.]

Samydaceae.

Ryania stipularis *Linden et Planch.* l.c. 22.

Ramulis angulatis nervisque foliorum subtus pube stellata adpressissima conspersis, foliis breviter petiolatis oblongis (12–15 cm. longis) eximie cuspidatis integris, stipulis subulatis saepius arcuatis persistentibus petiolo 3–5-plo longioribus, pedunculis axillaribus unifloris brevissimis pedicellis crassis incurvis calyce multo brevioribus, tomento adpresso rufidulo indutis, sepalis oblongo-lanceolatis circiter 3 cm. longis, staminibus crebris calyci subaequalibus, filamentis glabris basi imo tantum pilosis urceolo nectarii laxo ovario breviore margine fimbriato piloso, ovario hirsuto, stylo. . . . (in specimine deficiente).
Venezuela. Forêts sombres du versant nord de la chaîne de Carabobo, alt. 812 m., *Linden*.

Espèce voisine du *Ryania speciosa*, Vahl, dont elle diffère surtout par ses stipules persistantes, plus longues, et par ses étamines à filets glabres.

Polygalaceae.

Polygala plagioptera *Linden et Planch.* l.c. 29.

Herbacea humilis ramosa puberula, foliis alternis lanceolato-linearibus breviter petiolatis acutis margine leviter revolutis eglan-

dulosis, racemis axillaribus folium subaequantibus laxe 5–12-floris, bracteis subulatis caducis, pedicellis flore brevioribus floribus flore *Polygalae depressae* minoribus, sepalis internis (alis) oblique rhomboideo-ovatis obtusis basi attenuatis 5–nerviis viridibus apice violascentibus, corolla rosea, petalis lateralibus spatulato-oblongis unguiculatis, superiore galeato-carinato ecristato, capsula obovato-oblonga emarginata glabra alis longiore, seminibus oblongis dense pilosis caruncula compressa galeaeformi ornatis.
NOUVELLE-GRENADE. *Schlim*, sans numéro ni indication de localité.

Apparemment voisin du *Polygala brizoides* A. St.-Hil., mais distinct par ses grappes plus courtes, ses sépales intérieurs manifestement obliques, etc.

Securidaca densiflora *Linden et Planch.* l.c.

Scandens, ramis inflorescentiis pedicellis foliisque subtus tomento denso ferrugineo vestitis, foliis breviter petiolatis ovato-oblongis vel oblongis utrinque obtusis margine revolutis chartaceis reticulato-venosis supra nitidis pilosulis, stipulis non conspicuis, forsan intra tomentum occultatis, racemis terminalibus axillaribusque 3–6 cm. longis densifloris, bracteis subulatis caducis, pedicellis confertis flore subtriplo brevioribus, floribus saturate purpureis (vel violascentibus ?) sepalis externis pubescentibus, internis (alis) linea pubescente secus medium notatis, petalis inferioribus cuneato-spatulatis in unguem latum sensim contractis.
NOUVELLE-GRENADE. Probablement prov. d'Ocaña, *Schlim* (exemplaire unique, sans numéro).

Voisin du *Securidaca mollis* H.B.K. Il s'en distingue par ses grappes denses, l'absence, au moins apparente, de glandes stipulaires, une ligne de pubescence sur le milieu de chaque pièce interne du calice, ces mêmes pièces plus étroites, etc.

Securidaca purpurea *Linden et Planch.* l.c. 30.

Scandens, ramis rufo-velutinis, foliis breviter petiolatis ovatis vel ovato-oblongis basi rotundatis apice obtusiusculis reticulato-venosis supra nitidis pilosulis subtus dense pubescentibus, stipulis minutis pezizaeformibus glabris, racemis terminalibus plurifloris, pedicellis flore brevioribus, floribus saturate purpureis, sepalis externis obtusissimis margine excepto pubescentibus internis (alis) glabris ciliatis, petalis...(in specim. non evolutis).
VENEZUELA. Prov. de Merida, *Linden*, no. 582.

Voisin du *Securidaca volubilis* H.B.K., dont il s'écarte par sa pubescence plus dense, ses sépales externes plus pubescents, ses fleurs d'un pourpre foncé.

Securidaca rufescens *Planch. et Linden* ex Triana et Planch. Prodr. 134 (1862); Linden et Planch. l.c.
VENEZUELA. Prov. de Barquisimeto, région chaude, *Linden*, no. 279 ; San Cristobal (prov. de Merida) alt. 812 m., *Funck & Schlim*, no. 1458.

[The type-specimen of *S. rufescens* is presumably *Linden* 279, one of the two Venezuelan specimens from which the description was drawn up. Triana and Planchon l.c., identified a Colombian specimen with Linden's material.]

Monnina elongata *Planch. et Linden* ex Triana et Planch. l.c. 137 ; Linden et Planch. l.c. 32.

VENEZUELA. San Urbino (prov. de Trujillo), alt. 1300 m., *Linden* no. 375 (exemplaire imparfait) ; *Linden*, no. 339.
NOUVELLE-GRENADE. Prov. de Pamplona, alt. 2600 m. ; La Enllanada (prov. d'Ocaña), alt. 1500 m., *Schlim*, no. 674 ; Prov. d'Ocaña, sans désignation de localité, *Schlim*, nos. 87 et 679 ter.

[Only Colombian localities were cited by Triana and Planchon l.c. In the absence of evidence to the contrary, *Linden* 339 may be regarded as the type-specimen.]

CARYOPHYLLAÇEAE.

Arenaria humifusa *Linden et Planch.* l.c. 35.

Humilis glabra, caulibus humifusis ramosis, foliis lanceolato-linearibus sessilibus acutis margine scabriusculis uninerviis crassiusculis, pedicellis axillaribus unifloris folio brevioribus vel parum longioribus, flore magnitudine circiter *Moehringiae trinerviae*, sepalis ovato-oblongis breviter acuminatis acutis uninerviis, petalis calycem paulum superantibus ovatis albis sicut stamina manifeste perigynis, staminibus 10, ovario subgloboso, stylis 3 ovario longioribus ovulis paucis (circiter 20).

Forma β. Nana, caulibus vix 2 cm. longis.

VENEZUELA. Venta de Mucuchies (prov. de Merida), alt. 2400–2870 m. *Linden*, no. 393.—Forma β. Alto del Paramo de Mucuchies, alt. 3250–3900 m., *Linden*, no. 1486.

Cette plante ressemble, par le port, au *Stellaria uliginosa* (*Larbraea aquatica* A. St.-Hil.), dont elle se rapproche aussi par ses pétales et étamines très-franchement périgynes. Ses pétales entiers et l'ensemble de ses traits en font un véritable *Arenaria*.

[Redescribed from *Linden* 393 in 1911 by Briquet in Ann. Conserv. et Jard. Bot. Genève, xiii–xiv. 383, as a new species, *Arenaria venezuelana*.]

Cerastium meridense *Linden et Planch.* l.c.

Perenne multicaule (?) caulibus erectis simplicibus, foliis subcuneato-sessilibus inferioribus approximatis subrosulatis caeteris distantibus lanceolato-linearibus acutis utrinque, sicut caulis, pube crispula parce glandulosa laxa indutis, cyma terminali densiuscula pauciflora (rarius ramo altero adjecto bifida), bracteis herbaceis, pedicellis sub anthesi flore brevioribus erectis, floribus magnitudine florum *Cerastii arvensis*, sepalis lanceolatis acuminatis acutis dense glanduloso-pilosis extimis 2 undique herbaceis, intermedio hinc, intimis utrinque margine scariosis, petalis calycem

plus duplo excedentibus anguste cuneato-obovatis emarginatis albis, stylis 5 brevibus.

VENEZUELA. Sierra Nevada de Merida (prov. de Merida), alt. 3250 m. *Funck & Schlim*, no. 1642, *Schlim*, no. 1149.

Très-jolie espèce. Les exemplaires que nous avons sous les yeux ne représentent que des tiges isolées qui partaient probablement d'un rhizome commun. L'une de ces tiges présente, au-dessous de ses grandes feuilles ordinaires, quelques paires de petites squames imbriquées qui semblent caractériser un stolon.

[Redescribed in 1911 by Briquet, l.c. 382, under the name *Cerastium venezuelanum*. Briquet cited the same two collectors' numbers, but attributed them to Linden.]

MALVACEAE.

Malvaviscus Funckeanus *Linden et Planch.* l.c. 41 ; Gürke in Mart. Fl. Bras. xii. pars. 3, 540.

[Based on *Funck* 372, which is one of the syntype-numbers of *M. cuspidatus* Turcz. (1858).]

Malvaviscus elegans *Linden et Planch.* l.c. ; Gürke, l.c. 537.

Ramis petiolis pedicellis calycibusque tomentoso-hispidis, foliis anguste triangulari-cordatis cuspidatis 3-nerviis membranaceis repando-dentatis supra sparse subtus dense stellato-pubescentibus, pedicellis axillaribus petiolum superantibus, involucelli foliolis 10-12 linearibus calycem subaequantibus, calycis campanulati ad medium usque 5-fidi laciniis triangulari-lanceolatis subenerviis, corolla calycem plus duplo excedente.

VENEZUELA. La Peña (prov. de Trujillo), alt. 1625 m., août 1846, *Funck & Schlim*, no. 751.

Très-voisin du *Malvaviscus leucocarpus*, dont il s'éloigne par son calice à divisions plus allongées et dépourvues de nervures.

Malvaviscus speciosus *Linden et Planch.* l.c. 42 ; Gürke l.c. 538.

Tomentoso-hirtus, foliis cordatis saepius breviter trilobis crenato-dentatis supra sparse pilosis subtus molliter velutinis, pedicellis axillaribus petiolum subaequantibus, involucelli foliolis linearibus acutissimis enerviis calyci circiter aequilongis, calycis campanulati 5-fidi extus piloso-hirti laciniis triangularibus enerviis, corolla coccinea calycem triplo excedente.

VENEZUELA. Forêts de la province de Merida, alt. 1950 m., août 1842, *Linden*, no. 354.

Très-belle espèce, à grandes fleurs pourprées. Elle est très-voisine du *Malvaviscus elegans*, dont elle se distingue par ses feuilles presque toujours trilobées, et surtout par ses calices hispides et non veloutés, à divisions plus courtes et triangulaires.

Malvaviscus glabrescens *Linden et Planch.* l.c.

[Based on *Schlim* 105, which is the type-number of *M. oligotrichus* Turcz. (1858) ; Gürke, l.c. 536.]

Abutilon aurantiacum *Linden*, Cat. 1858, 11, nomen ; Linden et Planch. l.c. 44, descr.

[*Linden* 1508 and *Funck* 753, both from Puerto Cabello, which were the syntype-numbers of *A. aurantiacum* Linden, had previously been cited by Hooker in Bot. Mag. t. 4360 (1848) under *Sida integerrima* Hook. (*Abutilon integerrimum* Triana et Planch. Prodr. 182: 1862.) The combination *Abutilon integerrimum* was ascribed erroneously to Hooker in the Index Kewensis, and to Turczaninov by K. Schum. in Mart. Fl. Bras. xii. pars 3, 387.]

Abutilon eximium *Linden et Planch.* l.c.

[Founded on *Funck & Schlim* 749 and *Linden* 228. The former is the type-number of *A. pyramidale* Turcz. (1858), which is reduced to *A. auritum* Sweet by K. Schum. l.c. 377.]

TILIACEAE.

Luehea nobilis *Linden et Planch.* l.c. 52.

Arbor speciosa, ramulis stellato-hirtellis vel tomentellis, foliis breviter petiolatis ovatis vel rhomboïdeo-ovatis basi interdum leviter inaequali cuneatis vel rotundatis apice acuminatis cuspidatis acutis margine grosse et exserte duplicato-dentatis membranaceis supra viridibus sparse stellato-pilosulis subtus tomento tenui adpresso albidis nervis venisque reticulatis rufescentibus, pedunculo terminali unifloro florem subaequante medium versus tribracteato, flore diametro decimetrali albo, involucelli irregulariter 15–16-fidi vel partiti laciniis linearibus cuspidatis dorso tomento brevi indutis intus secus medium hirsutis, laciniis calycinis lineari-oblongis, petalis cuneato-flabelliformibus apice erosis ?, staminibus externis basi plus minus connexis, capsula acute pentagona apice rostrata circiter 5 cm. longa, diametro fere 2·5 cm. tomento detergili induta.

VENEZUELA. Entre Cabudare et Altar (prov. de Barquisimeto), août 1843, *Linden*.

[*Funck* 180, the type-number of *L. endopogon* Turcz. (1858) is named "*Luhea nobilis* Pl. et Lind." in Planchon's handwriting in the Kew Herbarium; and *L. nobilis* is given as a synonym of *L. endopogon* on a specimen collected by Triana at Cartagena.]

THEACEAE.

Ternstroemia camelliaefolia *Linden et Planch.* l.c. 56.

Glaberrima, foliis obovato-oblongis vel oblongis (10–12 cm. longis) basi acuta in petiolum longiusculum attenuatis apice rotundatis vel obtuse et breviter acuminatis margine obsolete crenulato-revolutis coriaceis siccitate utrinque tenuiter venosis subtus nigro-punctulatis, floribus axillaribus vel e parte denudata ramorum enatis, pedicellis calyce brevioribus subteretibus, bracteis calycinis sepalisque suborbiculatis, petalis late obovatis bilobis margine erosis calyce vix longioribus, bacca sicca ovato-globosa cerasi mole styli basi mucronata.—*Ternstroemia dentata* β *nudiflora* Choisy, Ternstroem. (Genève, 1855, in-4°), p. 18.

VENEZUELA. Galipan (prov. de Caracas), alt. 1624 m., janvier 1846, *Funck & Schlim*, no. 173.

Fleurs blanches.

La brièveté des pédicelles distingue nettement cette espèce du *Ternstroemia clusiaefolia* H.B.K., et du *Ternstroemia peduncularis* DC. La grandeur et la forme des feuilles ne permettent pas de la confondre avec le *Ternstroemia meridionalis* Linn. fil. Elle est plus voisine du *Ternstroemia Purdiaeana* Pl. et Tr., MSS, mais elle en diffère par ses feuilles plus grandes, moins coriaces, plus longuement pétiolées.

M. Choisy rapporte cette plante comme simple variété au *Ternstroemia dentata* Linn. Mais, à en juger par la figure qu'Aublet à donnée de ce dernier (sous le nom de *Taonobo*), il nous semble impossible d'admettre cette détermination spécifique. Les feuilles de notre plante sont à peine légèrement crénelées et non distinctement dentées, comme celles du type *dentata* de la Guyane.

[*Fendler* 50 and *Moritz* 1679 (Herb. Kew.), both from Colonia Tovar, are named "*Ternstroemia camelliaefolia* Pl. et. Lind." in Triana's handwriting.]

Saurauja floribunda *Linden et Planch.* l.c. 57.

Ramis inflorescentiis calycibus adpresse piloso-strigosis, foliis longiuscule petiolatis amplis (2–4 dm. longis) obovato-oblongis breviter cuspidatis acutis basi saepius obtusiusculis margine denticulatis (denticulis incurvis acutissimis) utrinque ad nervos strigosulis caeterum glabris, paniculis axillaribus terminalibus amplis pedunculatis folio brevioribus vel longioribus trichotome cymosis, bracteis linearibus vel lineari-lanceolatis acutis, pedicellis flore longioribus, floribus albis diametro circiter 15 mm., sepalis oblongis obtusis extimis 2 undique dorso strigosis aliis tribus linea dorsali strigosis caeterum albido-tomentellis, petalis oblongis calyce vix longioribus, staminibus basi pilis rufis intermixtis, ovario ovato-subgloboso glaberrimo, stylis stamina superantibus. VENEZUELA. Forêts épaisses de la prov. de Merida, alt. 1950 m., *Linden*, no. 611 ; près de Merida, *Funck & Schlim*, no. 898 ; prov. de Merida, alt. 2270 m., *Funck & Schlim*, no. 1615.

Très-belle espèce, ressemblant au *Saurauja excelsa*, dont elle diffère par les poils couchés et non étalés-crépus qui revêtent ses divers organes.

[Antedates *S. floribunda* Benth. ex Sprague (1905).]

Saurauja Goudotiana *Linden et Planch.* l.c. 58.

[Based on *Linden* 972, which is the type-number of *S. brachybotrys* Turcz. (1858).]

Haemocharis caracasana *Linden et Planch.* l.c. 59.

Ramis glabris, foliis cuneato-oblongis leviter rhomboïdeo-inaequilateris obtuse acuminatis basi revoluta in petiolum brevissimum attenuatis supra medium hinc serrulatis margine tenui revolutis crassiusculis supra glaberrimis subtus apicem versus in costa adpresse pilosulis subaveniis, pedicellis axillaribus unifloris calyce brevioribus glabris, sepalis 5–6 saepius emarginato-bilobis extus sericeis, petalis 7 inter se inaequalibus obovatis vel oblongis bilobis

dorso medio sericeis albis, ovario ovato sericeo-hirsuto, stylis 5 brevibus glabris. Flores diametro circiter 4·5 cm., albi, odorati. VENEZUELA. Caracas, alt. 1550 m., août 1843, *Linden*. no. 1464.

The type-number is represented in the Kew Herbarium.

Haemocharis pubescens *Linden et Planch*. l.c.

[The species was originally published as *Laplacea pubescens* Planch. et Linden in Triana et Planch. Prodr. 266 (1862).]

Marila magnifica *Linden et Planch*. l.c. 60.

Arbor ramis compressis sicut inflorescentiae calycesque tomento brevi rufo indutis, foliis amplis (sesquipedalibus et ultra) oblongis breviter acuminatis basi obtusa margine leviter repandis chartaceis, supra (in specim. exsiccato) castaneis nitidis glabratis subtus rufescentibus, nervis lateralibus numerosis, nervulis transversis subtus prominulis, racemo composito terminali opposite ramoso pedunculato foliis breviore, bracteis ad basim pedicelli parvis ovatis, pedicellis crassis calyce reflexo longioribus, sepalis 5 ovatis vel ovato-oblongis, petalis totidem albis cuneato-oblongis calyce parum longioribus, antheris linearibus filamenta vix flexuosa longitudine excedentibus glandula minuta subcapitata apiculatis, stylo brevi crasso ovario pluries breviore, stigmate subgloboso, ovario lineari-oblongo 3–loculare.

VENEZUELA. Forêts épaisses et humides entre Campanero et Soledad (prov. de Carabobo), *Linden*.

Voisin du *Marila macrophylla* Benth., dont il se distinguera aisément par son style très-court, au lieu d'être presque égal à l'ovaire.

SAUVAGESIACEAE.

Sauvagesia Brownei *Planch*. in Linden et Planch. l.c. 64, in adnot.; Urb. Symb. Antill. v. 430 (1908).

[Inserted in Index Kewensis, Suppl. 4, with the later reference only.]

VI.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—MR. E. H. G. SMITH, B.A., Superintendent, Agricultural Department, Nigeria: MR. W. J. HILL, District Agricultural Officer, Tanganyika Territory: MR. L. LORD, M.A., Divisional Agricultural Officer, Ceylon: MR. C. J. PYM, to be an Inspector of Plants, and Mr. E. M. COOK, to be an Assistant Superintendent, Agricultural Department, Gold Coast.

William Philip Hiern, F.R.S.—We regret to record the death of Mr. W. P. Hiern, which took place at The Castle, Barnstaple, on the 29th of November, 1925. Born at Stafford on the 19th of January, 1839, he entered St. John's College, Cambridge, in 1857, and graduated B.A. as ninth wrangler in 1861, proceeding to M.A. in 1864, and was from 1865 to 1868 a Fellow of his College. In 1868, he incorporated as M.A. at Christ Church, Oxford, about which time he turned his attention to botany and in 1873 published in the Transactions of the Cambridge Philosophical Society a monograph of the *Ebenaceae*. This was followed by accounts of the *Meliaceae* and *Sapindaceae* in Hooker's *Flora of British India*.

In 1873 an action was commenced in the High Court of Chancery by Dom Luis the First, King of Portugal, against William Carruthers and Frederick Justen, executors of Dr. Friedrich Welwitsch, to regain possession of the botanical collections made by the last named in Angola. The action ended in November, 1875, in a compromise declaring that the set of specimens next after the study set was to be presented to the British Museum, and the remainder to be at the disposal of the Portuguese Government. The division of the specimens and copying of the field notes was to be done in this country and Mr. Hiern was nominated by the Court, on behalf of the British Museum, to carry this into effect. This he proceeded to do and published an account of the "*Plants of Welwitsch's Apontamentos*" in the Journal of Botany, 1895, pp. 139–141. This was followed by a "Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853–1861" published to the end of the Dicotyledons between 1896 and 1900 in four parts. The remainder of the collection was dealt with by members of the British Museum Staff.

The greater part of volume iii. of the Flora of Tropical Africa, published in 1877, was written by Mr. Hiern, who alone was responsible for the *Umbelliferae*, *Araliaceae*, *Rubiaceae*, *Valerianaceae*, and *Ebenaceae*, and worked out the *Compositae* in conjunction with Prof. D. Oliver.

In 1881 Mr. Hiern had published, in conjunction with C. Ficahlo, in the Transactions of the Linnean Society a paper "On Central African Plants collected by Major Serpa Pinto". He also contributed various notes to the Journal of Botany. His work on the *Scrophulariaceae* occupied pp. 121–420 of volume iv. part 2, of the Flora Capensis in 1904, but he was obliged to decline the invitation to work out the same family for the Flora of Tropical Africa. After this he became Botanical Recorder for Devon and published a "Clavis to Devonian Sedges", based chiefly on vegetative characters in the Botanical Exchange Club Report, 1918 p. 414, and finally he turned his attention to public administration and became a Justice of the Peace and County Alderman for Devon.

Mr. Hiern was elected a Fellow of the Linnean Society in 1873 and of the Royal Society in 1903, and was also a corresponding

member of the Royal Academy of Lisbon. His wife and only son predeceased him.

C. H. W.

Samuel James Whitmee.—The Rev. S. J. Whitmee, F.R.G.S., whose death took place in London on December 10th, 1925, was a man with many interests. Born at Stagsden, Bedfordshire, in 1838, he went to Samoa in 1863, where, as well as in the neighbouring isles, he worked for fourteen years on behalf of the London Missionary Society. Returning to Europe in 1877, he became successively pastor of the York Street Church, Dublin, and of Arley Chapel, Bristol, but in 1891 again returned to Samoa for the London Missionary Society and worked amongst the foreign residents as well as helping in the mission to the natives. Here he became the close friend of R. L. Stevenson, whom he taught the Samoan language. Between 1872 and 1878 he published many notes in "Nature" on such subjects as "Earthquakes in the Samoan Islands," "Origin of Cyclones," "Meteors in the South Pacific," "The Flora and Fauna of New Guinea and the Pacific Islands," and in vol. xii, p. 291, a criticism (entitled "On the Influence of Volcanic Action in preventing the Growth of Corals") on Prof. Dana's review of Darwin's "Coral Reefs." In 1875 he contributed to "Ibis", vol v., a list of Samoan birds, and in 1878 to the Zoological Society's Proceedings a paper "On the Manifestation of Anger, Fear and other Passions in Fishes." A paper on "The Ethnology of the Pacific" appeared in the Victoria Institute Journal, xiv. pp. 16–31, 1881. In a letter to Sir J. D. Hooker, written from Blackheath in February, 1878, he speaks of sending him a "Comparative Dictionary of Polynesian Languages", which, however, was never published.

Mr. Whitmee's connection with Kew commenced in 1873, when seeds of two Samoan palms were received from him accompanied by a letter stating that he was "trying to make a complete collection of Samoan plants for my friend Dr. von Mueller of Melbourne". Between 1875 and 1878, Whitmee sent nearly 700 specimens to Kew, including 59 collected at his request in the Gilbert, Tokelau and Ellice Groups by Mr. Fritz Jensen and named by Sir F. von Mueller. Two collections of Samoan ferns from Whitmee formed the subject of two papers by Dr. J. G. Baker in the Journal of Botany for 1876, where 14 new species were described, including *Cyathea Whitmei*, *C. scabra*, *Nephrodium pubirachis*, *Oleandra Whitmei* and *Polypodium deltoideophyllum*. These collections are quoted in F. Reinecke's "Die Flora der Samoa-Inseln" in Engler's Jahrbücher, vol. xxiii. A further new species, *Nephrodium chrysotrichum* Baker, was published in the Annals of Botany, v. p. 328. The only new phanerogam appears to have been *Maba samoensis* Hiern, Journal of Botany, 1877, p. 99. Mr. Whitmee returned to England finally in 1894 and spent the latter part of his life at Barnet.

C. H. W.

Indian Provincial Floras.*—With the publication of Part i Mr. Haines brings to a conclusion his Botany of Bihar and Orissa. Parts ii to vi, which have been published during the past four years (*K.B.* 1922, p. 304), contain the systematic descriptions of the flora; the present part is a general introduction to the vegetation of the country and the factors influencing its composition and distribution.

Two useful maps are provided, one climatic and one topographical. The territorial limits of the flora are described and the climatic, topographical and geological features are discussed. A discussion on the general character of the flora and its œcology is given, with special notes on the Hazaribagh and Monghyr districts. The author devotes a chapter to a consideration of the principles and systems of classification, with an exposition of the method adopted in the present work, which, with some exceptions, adheres to that of Bentham and Hooker. An annotated conspectus of the Natural Families with a glossary of botanical terms and an index to Part i concludes this part.

Workers on Indian systematic botany in general, and those interested in this region in particular, are appreciative of the care which Mr. Haines has bestowed on this work, and he is to be congratulated on the eminently successful termination of an arduous labour. Not a small part of the value of this Flora is due to the fact that the author has an intimate acquaintance with the living plants described, which he has known personally in their natural habitat. This first-hand knowledge in the field he has supplemented by personal investigation in herbaria and by the scrutiny of type specimens whenever possible. C. E. C. F.

Nigerian Trees.†—Mr. Lely's book is a welcome contribution to our knowledge of Nigerian trees. It is only rarely that the field worker can be induced to give descriptions of plants as they grow in their natural habitats, and the present book is fortunately produced by an author who is also able to record his impressions pictorially. For information of the nature given by Mr. Lely one is generally dependent on the very scanty field notes that accompany herbarium specimens, and the drawings too often have to be made from preserved material. Mr. Lely's book will, therefore, be of particular value to the field worker and enable him to identify readily the common trees of the Nigerian savannah. Its sphere will not be limited to Nigeria only, for the same types of vegetation with the same floristic composition extend westwards right across the hinterland, and forest and agricultural officers throughout that region of West Africa will find the book of assistance.

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* The Botany of Bihar and Orissa, Part 1, by H. H. Haines, C.I.E., F.C.H., F.L.S. Adlard and Son and West Newman, Ltd., London, 1925, pp. ix and 199, one map in pocket. Price Rs. 8.

† The Useful Trees of Northern Nigeria, by H. V. Lely. The Crown Agents for the Colonies, 4, Millbank, Westminster. 1925. Pp. 128, text figs. 120. Price 10s.

The Preface contains a brief description of the country in which the author has worked—between 9° and 14° N. in Nigeria—and the general conditions of local agricultural practices and their relation to the savannah forests. He distinguishes two types, the woodland with a light though closed canopy, which he calls "tree savannah," and the parkland, of isolated trees growing in the grass, which he terms "bush savannah." He recognises four edaphic subtypes and comments on the occasional patches of pure forest that occur and on the recognition of Plant Indicators.

The descriptions, which are written to a uniform schedule to assist comparison of species, are arranged alphabetically, and contain general notes and successive paragraphs on the bark, wood, leaves, flowers, fruits and any peculiar characteristics.

The most valuable contribution of the book is the full page of outline drawings which accompanies the description of each species, and which will enable anyone in the country to recognise the trees without difficulty. An Appendix gives in tabular form the flowering seasons of the species described and there is also an Index of Hausa names.

The author is to be congratulated on the production of this well-illustrated book, which will be of much assistance to the field worker in the savannah country in West Africa.

Herbaceous Borders*.—This small book deals in a very concise and lucid manner with the many problems that vex the suburban gardener in the neighbourhood of large towns. Thorough cultivation at the beginning is rightly advised, as well as the use of lime, which is so important for the acid-laden soils of gardens in, or in close proximity to, large towns. The selection, arrangement, and maintenance of plants suitable for the small garden is discussed, and a series of tables gives the various plants arranged under the headings of tall, medium, and dwarf, the plants in each section being grouped under their respective colours.

We record with great regret the death of Mr. J. H. Maiden, I.S.O., F.R.S., on the 16th November last. A notice of his contributions to botanical science will appear in the next number of the Bulletin.

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* Herbaceous Borders for Amateurs, by R. V. Giffard Woolley. Country Life, Ltd., 20, Tavistock St., Covent Garden. 1926. Pp. 118, ill. 15. Price 5s.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1926
ROYAL BOTANIC GARDENS, KEW

VIII.—CLISTOYUCCA ARBORESCENS.

During the United States Expedition in 1853–4 to survey a route for a railway to the Pacific, Dr. Bigelow saw "whole forests" of a tree-like Yucca on the Mohave Creek, California, which was described as *Yucca Draconis* var. *arborescens* by Dr. Torrey in the report on that expedition, vol. iv, p. 147 (1856). This plant, first noticed by J. C. Frémont in 1844, has now been generically separated from *Yucca* by Dr. Trelease under the name of *Clistoyucca arborescens* Trelease on the following grounds :—

Clistoyucca. Segments of perianth thick [sometimes $\frac{1}{4}$ in.], mostly inflexed; style wanting; nectar-glands in walls of ovary small.

Yucca. Segments of perianth thin and petaloid, spreading at night; style evident; nectar-glands large but mostly inactive.

The following is the synonomy of the species with references to some of the literature.

Clistoyucca arborescens *Trelease* in Rep. Miss. Bot. Gard. xiii. 41 (1902).

Yucca Draconis var. *arborescens* Torr. in Pacif. Railr. Rep. iv. 147 (1856).

Yucca brevifolia Engelm. in Rep. King Expl. Exped. 496 (1871); Baker in Journ. Linn. Soc., Bot., xviii. 221 (1880); Trelease in Rep. Miss. Bot. Gard. 1893, 193; Gard. Chron. 1875, iii. 492; 1886, xxvi. 18; 1887, i. 773, fig. 145.

Yucca arborescens Trelease in Rep. Miss. Bot. Gard. 1892, 163, tt. 5 and 49; Coville in Contrib. U.S. Nat. Herb. iv. 201, frontispiece; Sargent, Silva, x. 19, t. 502; Karsten & Schenck, Veget.-bild. xiv. tt. 37-38a (1922).

The stem is simple until it reaches a height of 8 or 10 feet and is densely clothed to the base with leaves, which at length become reflexed. A sessile terminal panicle is then developed and below it arise lateral branches which repeat the same process, except that the leaves are confined to terminal tufts. In the Gardeners' Chronicle, 1887, i. 773, fig. 145, is shown an old trunk, which has bent over and rooted at the apex and bears at the top of the arch so formed a tall branch entirely covered with leaves as in young plants. The trunk attains a diameter of 2 feet, and is remarkable for its outer part resembling the cracked areolate bark of many

(18788.) Wt. 132—21. 1,125. 2/26. Wy. & S., Ltd. Gp. 50 (4).

Dicotyledons. It bears at the base a circle of confluent roots forming a disk, which is shown in Rep. Miss. Bot. Gard. 1893, t. 9. In the Mohave Desert region the plant is called the "Joshua Tree", and in 1880 attempts were made to manufacture paper-pulp from it, but these appear not to have been commercially successful. Professor Sargent states:—"Railroads now cross the Mohave Desert, and from the window of his car the traveller can see the forests of *Yucca arborescens* stretching indefinitely into the hazy distance, unlike any other forest on the continent, and without a rival in singularity and weirdness."

C. H. W.

We are indebted to Mr. Ernest Braunton, of Los Angeles, California, for kindly supplying these photographs and the following information about *Clistoyucca arborescens* Trelease, as it occurs in its home in the Mohave Desert, some fifteen miles east of Lancaster, Los Angeles County. The tree which is here illustrated is reputed to be one of the largest of the many millions growing in that country.

The species extends through the desert portions of southern Nevada to south-western Utah, and from the western arm of the Mohave Desert in Southern California northwards over the Walker Pass at an altitude of 5,000 feet to Kern River Valley.

The so-called "desert lands" on which this tree normally occurs are very productive where there is an ample water supply, and as it reaches its best development on the richest soil there is a danger that the finest specimens will disappear as the best land of these districts is taken into cultivation. The actual extinction of the species is not to be feared, for there are reported to be literally millions of trees extending over many thousands of acres where they form a conspicuous feature of the landscape in company with the Mesquite (*Prosopis juliflora*) and the Creosote Bush (*Larrea* spp.). At night time, particularly, they present a very weird and curious appearance as they are silhouetted against the clear sky above the light-coloured sandy surface of the desert.

The trees bloom only occasionally, and, as the inflorescences are terminal, they branch profusely. The oldest leaves reflex but remain on the trunk until it is 8 to 10 feet high; subsequent leaves are produced on the branches, while the trunk becomes bare. The desert regions in which these trees grow are subject to strong winds and whirlwinds, and the trees, owing to their branching habit, are apt to suffer severely, getting badly torn and large limbs being blown off completely. It is in this state that they present their most weird appearance.

They are cross-pollinated, and for this service depend on a noctoid moth, *Prronuba synthetica*, of a smoky tint. The first joint of the maxillary palp of this moth is much lengthened, beset on its inner surface with stiff bristles and can be rolled up like a trunk so as to enclose a ball of light yellow pollen, sometimes three times as large

PLATE V.

Clistoyucca arborescens, a young tree.

Clistoyucca arborescens, 62 ft. high, 20 ft. girth 2 ft. above ground. Fifteen miles east of Lancaster, Los Angeles.

[*To face page* 50.

PLATE VI.

Clistoyucca arborescens showing nature of the bark at lowest part of the bole

To face page 51.]

Photo. by E. Braunton.

as the insect's head. Having pierced the funnel-shaped stigma with its ovipositor and deposited a few eggs near the ovules, the moth turns around and stuffs the pollen down the hole it has made. The larvae are hatched on the fourth or fifth day and feed on the ovules, of which about 200 are produced in each ovary. The grubs require only 18 to 20 ovules for their sustenance until they escape from the fruit and thus leave an abundance of seeds for reproducing the plant. Without the insects, the production of seeds could not take place.

Snow falls every year in the county where this "Yucca" occurs and it should be able to be grown in the south of England in warm sunny localities with a dry atmosphere.

IX. NOTES ON THE FLORA OF RAPA. L. A. M. Riley.

("St. George" Pacific Expedition, 1924–5.*)

During the visit of the "St. George" to the South Pacific in the spring of 1925 botanical collections were made on four islands, viz.:—Napuka, one of the Disappointment Islands, Fakarava in the Tuamotu Archipelago, Rurutu, one of the Austral Group, and Rapa, which occupies an isolated position some 250 miles to the S.E. of the Australs.

In the absence of the writer, who had been compelled to return to England on medical advice, collecting was carried out by Lieut.-Colonel H. J. Kelsall, the ornithologist, and Mr. C. L. Collenette, one of the entomologists, who also was largely responsible for the organisation of the Expedition. Several specimens were collected by Miss C. E. Longfield, who accompanied the Expedition.

Thirty species altogether were obtained on the first three islands visited; unfortunately they represent only species common in Polynesia or cosmopolitan in distribution. But on Rapa, of the seventeen species collected, four are apparently new to science, of which one, *Corokia Collenettei* Riley, is of considerable phytogeographical import, inasmuch as the genus was previously known only from New Zealand and the Chatham Islands, over 2,000 miles distant. They are described below, and, on account of the fact that, so far as has been ascertained, no botanical work has previously been done on Rapa, it has seemed desirable to give the complete list of the collection, together with a few notes on the vegetation of this little-known island. The duration of the visit of the "St. George" was from April 10th to 18th, 1925.

Rapa is situated in 27° 36 S., 144° 17 W., and is five miles in length by four in breadth. It is of volcanic origin with steep jagged peaks, of which the highest rises to 2,077 ft. In shape it resembles a

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* The following papers on the botanical results of the "St. George" Pacific Expedition, 1924–5, have already appeared: "Notes on Madeira Plants" (*Kew Bull.* 1925, 26–33); "Critical Notes on Trinidad Plants" (l.c. 133–142); "Critical Notes on Galapagos Plants" (l.c. 216–231).

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SAVAII
DISAPPOINTMENT Is
Napuka
NEW HEBRIDES
FIJI ISLANDS
SAMOA OR NAVIGATOR Is
SOCIETY Is
Tahiti
TONGA OR FRIENDLY Is
TUAMOTU OR LOW ARCHIPELAGO
COOK OR HERVEY Is
NEW CALEDONIA
LOYALTY Is
Rurutua
TROPIC OF CAPRICORN
TUBUAI OR AUSTRAL Is
RAPA OR OPARU
NELSON Is
BASS Is
NORFOLK Is
NEW ZEALAND
CHATHAM Is
PACIFIC OCEAN

misshapen letter "C", thickened towards the north and south, with the interior occupied by Ahurei Bay, which fills the bed of an ancient crater and opens to the sea on the eastern side. The island is little visited by vessels, and, according to Mr. Collenette, the natives still use the candle-nut [*Aleurites moluccana*] for illumination in preference to oil. Mr. Collenette has kindly contributed the following notes on the vegetation:—

"The neighbourhood of the village of Ahurei presents little of botanical interest, orange and lime trees, castor oil plants, and *Hibiscus tiliaceus* L., being predominant. The island possesses many streams, which are utilised on the lower ground for the irrigation of extensive taro beds [*Colocasia antiquorum*], this vegetable being the principal food of the inhabitants.

"The greater part of the hill slopes are covered with a growth of short grass and a species of fern, larger growth being kept down by grass fires and by the high winds which bend and deform any isolated unsheltered trees. Thick vegetation clothes some of the higher peaks, the sheltered and damp gullies down to sea level, and the slopes of detritus at the foot of cliffs. At lower levels in these situations the candle-nut predominates, together with *Fitchia nutans* Hook. f., and a riot of limes, guavas, peppers, and large ferns. At about 500 feet a Tree-fern makes an appearance, becoming more plentiful as the elevation increases and eventually completely dominating all other trees.

"In number of species the flora presents a great contrast to that of the tropical islands which the "St. George" had recently visited. Apart from three or four plants which could not be found in flower or fruit, and excluding others which were of common occurrence in Tahiti or the Marquesas, every species met with was collected. Of the seventeen species comprising the collection brought home, several were included merely for the identification of the food plants of certain lepidopterous larvae.

"About a dozen coconut palms and at least one mango tree were seen, with an excellent growth of leaf, but we were informed that they never fruited. On the other hand, groves of orange trees in the village bore exceptional loads of fruit."

The first set of Polynesian plants has been presented by the Scientific Expeditionary Research Association to Kew, and the second set to the British Museum.

List of plants collected on Rapa Island.

Sida rhombifolia L., no. 774.

Oxalis corniculata L., no. 769.

Dodonaea viscosa L., no. 780.

Weinmannia parviflora Forst., no. 772.

Jussieua suffruticosa L., no. 784.

Corokia Collenettei *Riley*, sp. nov.; *C. macrocarpae* Kirk et *C. buddleoidei* A. Cunn. affinis, ab illa foliis longe petiolatis nervis

lateralibus magis ascendentibus, paniculis longioribus et laxifloris, ab hac forma foliorum, petiolis multo longioribus, paniculis laxioribus, floribus et fructu multo minoribus differt.

Arbor 4.5 m. alta. *Ramuli* stricti, robusti, fere 5 mm. diametro 15 cm. infra apicem, striato-rugosi, ob folia delapsa cicatricosi, cinereo-pilosi. *Folia* oblanceolata, 5–8 cm. longa, 1.5–2.8 cm. lata, obtusa vel subacuta, apiculata, basi in petiolum gradatim angustata, integra vel saepius versus apicem irregulariter denticulata, coriacea, supra glabra, iuventute pilosa, laete viridia, subtus albo-tomentosa, nervis lateralibus utrinsecus 7–8 satis manifestis supra cum rete venularum impressis subtus elevatis; petioli 1–1.8 cm. longi, compressi, albo-tomentosi, setulis minutis nigris intersparsis. *Inflorescentia* racemosa vel subpaniculata, axillaris, circiter 7.5 cm. longa, 10–16-flora, ubique tomentosa; bracteae lineari-lanceolatae, 4.5–5 mm. longae, acutae; bracteolae circiter 2 mm. longae. *Pedicelli* 6–7 mm. longi. *Lobi calycis* 6–7, acute triangulati, 2.5–2.75 mm. longi, basi 1–1.5 mm. lati, intus glabri, marginibus subrevolutis. *Petala* 6–7, carnosa, lutea, basi connata sed primo visu libera, anguste oblongo-ovata, 6 mm. longa, 2 mm. lata, subacuta, apice incurvo, extra villosa, intus glabra. *Stamina* 6–7, omnino glabra; filamenta 2.5 mm. longa, basi fere 0.5 mm. lata, apice angustata, nonnunquam basi petalorum adnata; antherae versatiles, oblongo-ovatae, 2 mm. longae, 0.75 mm. latae, subacutae. *Ovarium* disco carnoso 2.25 mm. diametro coronatum; stylus 5 mm. longus, apice capitatus, 5-lobus; ovula oblonga, 0.75 mm. longa, 0.25 mm. lata. *Drupa* ovoidea, obtuse 4–5-angulata, iuventute cinereo-pubescens, demum glabra vel basi tantum pubescens, rugosa, nigra, 3–4-locularis. *Semina* in quoque loculo solitaria, oblonga vel subconica, 3.5 mm. longa, 1.25 mm. diametro, fulva, sub lente punctulata.

Rapa; in exposed situations on hill summit, 240 m., fl. and fr. April, *Collenette in Riley 777* (type in Herb. Kew.).

Mr. Collenette remarks that the flowers have a faint scent resembling cowslips.

The genus *Corokia* has hitherto been regarded as endemic in New Zealand and the Chatham Islands. Its known range is now extended over 2,000 miles by the discovery of *C. Collenettei*.

Plectronia Rapae *Riley*, sp. nov.; *P. barbatae* (Forst.) Benth. et Hook. f. affinis, sed foliis vix coriaceis brevissime et late obtuse cuspidatis nonnunquam fere rotundatis tantum, supra nitidis subtus subnitidis et conspicue reticulatis, stipulis longioribus, calyce fere truncato vel inconspicue dentato differt.

Arbor patens, 3 m. alta. *Ramuli* satis robusti, 3 mm. diametro 15 cm. infra apicem, subquadrangulati, glabri. *Folia* ovata, 6.5–10 cm. longa, 3.8–6.2 cm. lata, brevissime et late obtuse cuspidata, rarius rotundata, basi acute cuneata, integra, utrinque obscura, glabra, supra nitida, subtus subnitida, nervis lateralibus utrinsecus 5–6 valde ascendentibus supra manifestis subtus cum costa elevata et rete venularum conspicuis; petioli 5–7 mm. longi.

Stipulae e basi 3 mm. lata triangulato-acuminatae, 5 mm. longae. *Cymae* axillares, umbellatae, 2–4-florae. *Pedunculi* 0.5–3 mm. longi. *Pedicelli* 8 mm. longi. *Flores* odorati. *Tubum calycis* subnullum, inconspicue 5-dentatum vel fere truncatum, sparse ciliatum. *Corolla* lutea, carnosa, extra glabra, tubo 5 mm. longo 2 mm. diametro intus hirsuto, lobis 5 ovatis 5–5.5 mm. longis circiter 2.5 mm. latis acutis subapiculatis marginibus revolutis, utrinque glabris. *Stamina* 5, summo tubo calycis inserta; filamenta brevissima; antherae ovoideae, 1.25 mm. longae, 1 mm. diametro. *Ovarium* obconicum 2.25 mm. longum, 1.75 mm. diametro; stylus 7.5 mm. longus, capitatus, 2-lobus, glaber. *Fructus* haud visus.

Rapa; in sheltered situation among other trees at head of valley, fl. April, *Longfield in Riley* 778 (type in Herb. Kew.).

Erigeron bonariensis L., no. 785.

Fitchia nutans Hook. f., no. 773.

Gnaphalium luteo-album L., no. 771.

Vaccinium cereum Forst., no. 782.

Verbena officinalis L., no. 775.

Peperomia leptostachya Hook. et Arn., no. 783.

Piper latifolium L. f., no. 779.

Claoxylon Collenettei *Riley*, sp. nov.; a *C. taitensi* Muell. Arg. foliis valde dentatis breviter obtuse cuspidatis haud acutis recedit.

Arbor ad 3.6 m. alta. *Ramuli* robusti, 5.5 mm. diametro 15 cm. infra apicem, longitudinaliter rugosi, glabri, fulvi. *Folia* elliptica vel ovato-elliptica, 6–15 cm. longa, 3.5–6.5 cm. lata, breviter et obtuse cuspidata, basi cuneata, satis remote obtuse dentata, coriacea, utrinque glabra, supra obscura, subtus pallidiora, nervis lateralibus utrinsecus 4–8 utrinque subelevatis, costa subtus manifeste elevata; petioli robusti, saepius ut ramuli suberosi, 5 mm. infra basin foliorum 1.5–2.5 mm. diametro, plerumque 3–5.5 cm. longi, raro breviores, transverse rugosi. *Stipulae* haud visae. *Inflorescentiae* axillares, elongatae, 2.5–8 cm. longae, satis laxiflorae, puberulae. *Pedicelli* 3.75 mm. longi. *Alabastra matura* globosa, 2.5–3 mm. diametro. *Sepala* 3, late obovata, 4 mm. longa, 3 mm. lata, rotundata, integra, extra pubescentia. *Stamina* numerosa; filamenta, libera, 1.5 mm. longa, gracilia, glabra; antherarum loculi obovoidei, 0.25 mm. longi, apice divergentes. *Flores feminei* haud visi.

Rapa; in sheltered situation among other trees at head of valley, 180 m., fl. April, *Collenette in Riley* 781 (type in Herb. Kew.).

Mr. Collenette appends a note to the effect that there was only one flowering branch on the tree.

Phyllanthus Longfieldiae *Riley*, sp. nov.; *P. sandwicensi* Muell. Arg. affinis, sed indumento totius plantae, necnon forma et magnitudine foliorum manifeste differt.

Arbuscula imminuta, usque ad 1.2 m. alta, habitu patenti. *Ramuli* satis robusti, 2.5 mm. diametro 15 cm. infra apicem, striato-rugulosi, plerumque fusco-pubescentes, iuniores versus apicem cinereo-pubescentes. *Folia* elliptica, rarius oblongo-elliptica, latiores nonnunquam subpanduriformia, 1.7–5.3 cm. longa, 1–3 cm. lata, obtusa, basi oblique subcuneata, integra, utrinque obscura, supra sparse, subtus satis pilosa, nervis lateralibus utrinsecus 7–10 plerumque fere sub angulo recto patentibus supra haud conspicuis subtus cum rete venularum satis manifestis; petioli 3–4 mm. longi; stipulae triangulato-acuminatae, 2–2.5 mm. longae, basi 1.5 mm. latae. *Flores* in axillis 2–5-fasciculati. *Pedicelli* 4 mm. longi, glabri. *Tepala* floris feminei 6, carnosa, 2.5 mm. longa, 1 mm. lata, lutea; exteriora oblongo-elliptica, obtusa extra pubescentia; interiora elliptica, subacuta, utrinque glabra. *Ovarium* breviter stipitatum, 6-gonum, 0.75 mm. altum, 0.75 mm. diametro, glabrum; styli crassi, acuti, integri, 0.75 mm. longi. *Flores masculi* haud visi.

RAPA; on windswept hill-side among grass and ferns, fl. April, *Longfield in Riley* 776 (type in Herb. Kew.).

Dianella intermedia Endl., no. 770.

X.—SPOLIA MENTAWIENSIA. C. BODEN KLOSS.

The Mentawi Group, to the west of Sumatra, consists of the islands of Siberut, Sipora, North and South Pagi, and a number of smaller islands. Siberut, the northernmost, is larger than the total area of the other three large islands, which are fairly equal in size.

The islands are covered with heavy forest and their botany was unknown before the present expedition. A few plants, however, had been collected on Sipora by Herr Alfred Maas in the nineties ("Bei liebenswürdigen Wilden", Berlin 1902), and a few had been sent home from the Pagi Islands by Dr. W. L. Abbott and myself in 1902.

I visited the islands in September and October, 1924, with Mr. N. Smedley, Assistant Curator of the Raffles Museum, Singapore, and a party of native collectors. Dr. H. H. Karny, Entomological Assistant of the Buitenzorg Museum, Java, also accompanied me, with native assistants, one of whom collected plants for the Herbarium at Buitenzorg. The material here discussed was obtained with the assistance of a native collector attached, on my invitation, by Mr. I. H. Burkill, then Director, Botanic Gardens, Straits Settlements.

The Mentawi Islands are not very pleasant collecting grounds: they are largely swamp out of which rise hills nowhere exceeding 1,500 feet in height, and generally difficult to get to, as they are surrounded by soft ground. The Sago palm is common. The villages of the interesting Indonesian inhabitants are all situated on river-banks a few miles up-stream, and there are scarcely any

paths except those made at the direction of the Dutch military posts for patrol purposes: these are often untraversable owing to floods, for there is much rain throughout the year.

The collection was obtained near the Government stations at Siberut in the island of that name and Sioban in Sipora: it came from the sea-shore, low ground and swamps, cultivated areas, and from such hills up to 500 or 600 feet as we were able to attain. Owing to wet weather the plants had to be dried over fires.

The Mentawi Islands lie parallel to, and 60–80 miles distant from, the west coast of Sumatra. Siberut is about 70 miles long and about 30 miles broad and its northernmost extremity is on Lat. 1° South.

The islands are apparently connected with each other by sea-bottom of less than 100 fathoms in depth, and recent bathygraphical charts show a connection with Sumatra, via the Batu Islands to the north, by a narrow ridge of similar soundings, but I am inclined to doubt that this ridge is unbroken as indicated: some faunal groups exhibit remarkable peculiarities. Otherwise the islands are surrounded by depths of 100–500 fathoms of sea: further, everywhere directly between the group and Sumatra stretches the long Mentawi Sea, or Basin, with depths of 500–1000 fathoms.

In view of the fact that nearly all the other land masses of Malaysia (the Peninsula, Sumatra, Java, Bali, Borneo, Palawan, etc.) stand on a shallow bank of less than 40 fathoms we should expect to find a greater difference between the Mentawi Islands and the rest of the sub-region than between any other two parts of it ; but this collection indicates that, botanically, such is not the case. Possibly this is due to the lowness of the islands and their comparatively small size.

The heights given for species are only approximate, but they serve to show whether the specimens came from plants tall, medium, or low.

Spolia Mentawiensia is the general title under which, in various journals, all the reports, in the main zoological, on the 1924 visit to the islands will be published.

The Flora of the Mentawi Islands. H. N. Ridley.

The study of the Sumatran flora, which has been till late rather neglected by botanists, is gradually being completed by collections such as this very interesting one by Mr. C. Boden Kloss. The collection contains 365 species, of which 119 have not as yet been discovered in the adjacent Malay Peninsula and are confined to Sumatra, and of these there are 54 new species and one new genus.

The plants were all from the lowlands, and those of the coastal areas have a greater affinity with those of the low country in the Malay Peninsula. There can be little doubt that at no very distant geological period Sumatra was joined to the Malay Peninsula and in this way we may account for a large number of plants

being common to both. But besides that many of the seashore plants, widely dispersed by sea currents, have been drifted from shore to shore as seeds, and further the strait between the two areas is not so wide but that many seeds could have been brought by birds and bats from one to another.

Still the Sumatran flora has certain peculiar characteristics shown clearly in this collection which distinguish it from the flora of the Malay Peninsula, and which have also been shown in other collections made further inland in the island.

The genus *Saurauja* is extremely well represented in Sumatra, Java and Borneo, there being about fifty species, many of which are shrubs and bushes. In the Malay Peninsula the shrubby kinds are completely absent and only a few trees, five in all, occur, and these by no means abundantly. Among the *Gesneraceae* we find the fact that while the genera *Didymocarpus* and *Didissandra* are very largely represented in the Malay Peninsula (*Didymocarpus* 56 species, *Didissandra* 16), they are very scanty in Sumatra, Java and Borneo, (*Didymocarpus* 30, *Didissandra* 6). On the other hand the genus *Cyrtandra* is abundant in Sumatra, Java and Borneo, with about 90 species, and restricted in the Malay Peninsula to 12 species. In this case the genus appears to have come in a westerly direction from Polynesia where it is very abundant and disappears entirely a little north of the peninsula. While in the case of *Didymocarpus* the genus appears largely to have come from India southwards to the Malay Peninsula where it has developed very extensively.

The extreme scarceness of species of Palaearctic plants in the Malay Peninsula as compared with those of Sumatra and Java, e.g., *Viola, Disporum, Anemone, Sanicula, Lonicera*, and the absence of *Ranunculus, Fragaria, Juncus, Agrimonia, Alchemilla*, etc., is very striking, and I think that the few species that occur in the Malay peninsula are the remains of a flora which crossed from Sumatra when it was connected with the Malay Peninsula.

The most important new species in this collection are a second species of the hitherto monotypic genus *Zuccarinia*, previously known only from Java, the yellow-flowered *Staurogyne citrina*, all the other species having white or brown flowers, and the curious new genus *Polycycliska* belonging to the small Malayan group of *Coptophyllum* and *Pomazota*. The occurrence of *Xanthophytum Villarii* previously known only from the Philippines is a remarkable extension of distribution.

Dilleniaceae.

Dillenia meliosmaefolia *Hook. fil.* Siberut, 14033. Height 60 ft.

Tetracera assa *DC.* Collected many years ago in Pagi by Kloss and Abbott.

SCHIZANDRACEAE.

Kadsura scandens *Bl.* Siberut, 14542. Flowers yellow with red centre ; creeper.

K. cauliflora *Bl.* Sipora, 14709. Flowers crimson.

ANONACEAE.

Polyalthia Teysmanni *Miq.* Sipora, 14794. Petals dull pale crimson; fruit crimson brown.

Popowia rufescens *Ridl.* n. sp.; affinis *P. ramosissimae* Hook. fil., differt foliis subtus ferrugineo-hirtis, floribus majoribus racemosis.

Arbor 5–7 m. alta, ramis nigrescentibus, partibus juvenibus rufo-hirto-velutinis; *foliis* elliptico-lanceolatis cuspidato-acuminatis, basibus obtusis paullisper inaequilateris, superne glabris, subtus minute pustulosis, nervis superne immersis, 10-paribus, subtus costa elevata dense hirta, (in sicco subtus cinnamomeis) 8 cm. longis, 3 cm. latis; petiolis brevissimis rufo-hirtis; *racemis* extra-axillaribus 1 cm. longis, dense rufo-hirtis paucifloris, pedicellis rufo-hirtis crassis 2 mm. longis; *sepalis* brevibus ovatis rufo-hirtis 2 mm. longis; *petalis* exterioribus albis, albo-hirtis; *sepalis* superantibus, interioribus rotundatis glabris; *staminibus* paucis in seriebus 5; *antheris* oblongis, appendicibus latis ovatis; *pistillis* glabris 6; *stigmatibus* planis latiusculis.

Siberut, 14607. Flowers white, fruit green; 15 to 20 ft. high.

Goniothalamus costulatus *Miq.* Siberut or Sipora, 14781.

MENISPERMACEAE.

Tinomiscium javanicum *Miers.* Sipora, 14688. Flowers white, creeper.

NYMPHAEACEAE.

Barclaya Motleyi *Hook. fil.* Siberut, 14618. Flowers dark red.

VIOLACEAE.

Neckia lancifolia *Hook. fil.* Siberut, 14076. Only known previously from Borneo.

POLYGALACEAE.

Xanthophyllum ellipticum *Miq.* Sipora, 14835. Fruit green.

HYPERICACEAE.

Hypericum japonicum *Thunb.* Siberut, 14479. Flowers orange.

FLACOURTIACEAE.

Flacourtia inermis *Roxb.* Sipora, 14822. Fruit pale green; 30 ft. high.

Scolopia rhinanthera *Clos*. Sipora, 14646. Fruit green; 10 to 15 ft. high.

Guttiferae.

Calophyllum inophyllum *L*. Sipora, 14763. Flowers white, stamens yellow; 35 ft. high.

Ternstroemiaceae.

Saurauja tristyla *DC*. Siberut, 14499. Height 10 ft.

Saurauja singalanensis *Korth*. Siberut, 14489: flowers white. Sipora, 14662: flowers white, stamens yellow.

var. **longifolia** *Ridl*. n. var.; foliis lanceolatis utrinque acuminatis, 18 cm. longis, 4.5 cm latis. Siberut, 11434. Fruit white, centre yellow, hairs red.

Saurauja siporensis *Ridl*. n. sp.; *S. lanceolatae* DC. affinis, sed foliis tenuioribus pallide cinnamomeis in dorsis, sepalis spinulosis, stylis 7.

Frutex 9 m. altus, ramis spinulis planis lanceolatis acuminatis appressis, 3 mm. longis tectis; *foliis* tenuiter coriaceis, subtus cinnamomeo-albis lanceolato-oblongis obscure serrulatis spinulosis ad apices abrupte cuspidatis, basibus rotundatis vel breviter angustatis inaequilateribus, nervis 13-paribus subtus elevatis superne glabris, subtus nervis et nervulis parce spinulosis, 17 cm. longis, 7 cm. latis; petiolis 3 cm. longis, dense spinulosis; *racemo* brevi axillari spinuloso 2 cm. longo; *sepalis* oblongo-ovatis, 3 mm. longis spinulosis; *petalis* parvis albis; *staminibus* 12; *stylis* 4; *ovario* hirsuto.

Sipora, 14828. Flowers white; 10 ft. high.

Dipterocarpaceae.

Dipterocarpus retusus *Bl*. Sipora, 14719, 14749. Pagi, 14633. Height 70 to 80 ft. Siberut, 14452: large tree.

Vatica lutea *Ridl*. n. sp.; differt a *V. cinereae* King in foliis tenuioribus haud minute reticulatis, floribus minoribus glabrioribus.

Arbor 13 m. alta, ramulis et paniculis furfuraceis; *foliis* lanceolatis acuminatis acutis basibus obtusis, coriaceis glabris, nervis 12-paribus paullo elevatis intra marginibus arcuantibus 8 cm. longis, 3 cm. latis; petiolis crassis furfuraceis 5 mm. longis; *paniculis* et *racemis* axillaribus, 3 cm. longis, pedicellis 2–4 mm. longis: *sepalis* 5, oblongo-lanceolatis patentibus, utrinque velutinis 2 mm. longis; *petalis* lineari-oblongis obtusis imbricatis, 5 mm. longis, glabris luteis; *staminibus* 15, filamentis triangularibus acutis, antheris oblongis seta terminali corniformi; *ovario* conico velutino; *stylo* cylindrico crassiusculo; *stigmate* bilobo, lobis rotundatis. *Fructus* ignotus.

Siberut, 14581. Flowers yellow; 40 ft. high.

I have seen no fruit, so that I am not sure whether this is a true *Vatica*, in the restricted sense.

MALVACEAE.

Urena lobata *Linn.* Siberut, 13078. Sipora, 14798. Flowers pink.

STERCULIACEAE.

Sterculia rubiginosa *Vent.* Sipora, 14736. Flowers red and white; 10 to 15 ft. high.

TILIACEAE.

Grewia acuminata *Miq.* Sipora, 14679. Creeper; fruit russet green; a very velvety form of this variable plant.

LINACEAE.

Roucheria Griffithiana *Planch.* Siberut, 14532. Fruit yellow.

RUTACEAE.

Luvunga eleutheranthera *Dalz.* Siberut, 14611. Flowers white; creeper.

SIMARUBACEAE.

Samadera indica *Gaertn.* Siberut, 11431. Flowers yellowish-white; 10 ft. tall.

Eurycoma longifolia *Jack.* Siberut, 11444. Flowers and fruit red; 15 ft. high.

OCHNACEAE.

Gomphia Hookeri *Planch.* Siberut, 14560. Fruit red.

OLACINEAE.

Stemonurus pauciflorus *Ridl.* n. sp.; affinis *S. corniculato* Ridl., sed inflorescentia multo laxiore floribusque paucioribus minoribus.

Arbor glabra; *foliis* coriaceis (siccis subtus cinnamomeis) oblongis vel ellipticis obtusis vel breviter acuminatis, nervis indistinctis circiter 8-paribus, costa prominente, 8 cm. longis, 4.5 cm. latis; petiolis 1 cm. longis; *cymis* axillaribus gracilibus, pedunculis 1–2 cm. longis, ramis 3–5 umbellatis 1.5–2 cm. longis; *floribus* albis 5–6 secundis sessilibus, 4 mm. longis; *calyce* cupulari griseo, dentibus brevissimis 5; *petalis* oblongis obtusis coriaceis; *staminibus* pilis longissimis albis; *ovario* conico acuminato; *drupis* immaturis lanceolatis acuminatis.

Siberut, 14487. Flowers white.

Gonocaryum sp. Siberut, 1458. Greenish fruit; 10 ft. high.

Most nearly allied to *G. Griffithianum* Kurz, of Tenasserim. The leaves are broadly ovate, some very unequally lobed at the base. The fruit is not angled. It is not *G. gracile* Miq. of Sumatra, as that has angled fruit.

Ilicineae.

Ilex Engleriana *Loesen.* Siberut, 14504. Height 5 ft.

A similar plant with longer racemes was collected by Forbes on the Dempo. I have not seen the type which was collected by Beccari on Mount Singalan.

Celastraceae.

Salacia viminea *Wall.* Siberut, 14521. Petals brown; creeper.

S. flavescens *Kurz.* Siberut, 14521. Flowers white, base of petals brown.

S. prinoides *DC.* Siberut, 14476. Flowers greenish-yellow; creeper.

Rhamnaceae.

Zizyphus aenoplia *Mill.* Siberut, 14571. Flowers greenish-yellow; creeper.

Z. Horsfieldii *Miq.* Siberut, 14619. Fruit brown; creeper.

Ampelidaceae.

Tetrastigma papillosum *Bl.* Siberut, 14472: flowers green to reddish yellow. Sipora, 14832: flowers pink; stems and stamens red.

T. pergamaceum *Planch.* var.? Siberut, 14080. Fruit green; creeper.

I have no complete flowers of this specimen and the fruit appears to be much smaller than in the species.

Tetrastigma encephalosperma *Ridl.* n. sp.; affinis *T. glabrato* Planch. sed bacca multo minore et foliis majoribus, seminibus cerebriformi-sulcatis.

Glabra, caule laevi gracili; *foliis* trifoliatis petiolis 8 cm. longis, foliolis carnoso-coriaceis elliptico-lanceolatis acuminatis, basibus cuneatis, marginibus sparse serratis versus apices, 12 cm. longis, 8 cm. latis, nervis indistinctis vel invisis, petiolulis 1 cm. longis; *cymis* axillaribus crassiusculis 3.5 cm. longis et aequilatis; *bracteis* ad bases ovatis coriaceis obtusis; *calyce* brevi patelliformi; *petalis staminibusque* haud visis; *disco* anguste annulari; *stylo* brevi; *stigmate* pulviniformi obscure lobato; *baccis* globosis viridibus 6 mm. longis dense congestis, infructescentia 5 cm. lata; *seminibus* 2 ovalibus complanatis 6 mm. longis, dorso rotundato sulcato et

medio sulci carinato lateribus sulcis cerebriformibus, ventre plano sulcato et carinato, sulcis horizontalibus.

Sipora, 14643. Fruit green.

Allied to *T. glabratum* Planch. but the fruit is much smaller and the leaves larger. The seeds have cerebriform, shallow grooves on the back, the inner face having perpendicular grooves with transverse lateral branches.

Cissus cerasiformis *Teysm. & Binn.* Sipora, 14664. Fruit crimson to pinkish green; creeper.

C. pyrrhodasys *Miq.* Sipora, 14716. Fruit green.

Cissus flaviflorus *Ridl.* n. sp.; affinis *C. geniculato* Bl., sed foliolis latioribus haud denticulatis subtus hirtis, cyma multo majore floribus majoribus.

Caule gracili flexuoso hirto; *foliis* trifoliatis herbaceis ovatis basibus latis apice acuminato, lateralibus obliquis marginibus undulatis subserratis, nervis e basi 5, e costa 5-paribus superne scaberulis, subtus molliter hirtis, 7 cm. longis, 5 cm. latis, petiolis hirtis 4 cm. longis, petiolulis 2 cm. longis; *cymis* axillaribus puberulis, pedunculis 6 cm. longis, ramis 2, 6 cm. longis laxe ramosis, pedicellis 2 mm. longis; *calyce* poculiformi integro; *petalis* 4 ad apices connatis oblongis 1 mm. longis glabris flavis; *staminibus* filamentis brevissimis, antheris lanceolatis obtusis basi latioribus; *disco* majusculo annulari 8-lobo, lobis 4 emarginatis; *stylo* brevissimo; *stigmate* punctiformi; *baccis* globosis viridibus 4 mm. longis; *seminibus* 1 to 4, dorsis rotundatis carinatis, ventre acuto nervo ramoso in utro facie.

Sipora, 14733. Flowers yellow; fruit green.

Cayratia mollissima *Gagnepain.* Siberut, 14568. Fruit green; creeper.

Leea gigantea *Griff.* Siberut, 10598. Flowers white; 5 ft. high.

L. aequata *Linn.* Siberut, 11430: fruit russet; 5 ft. high. Sipora, 14710: flowers pale green, centre yellow; stems crimson.

L. aculeata *Bl.* Siberut, 14630: flowers pink. Sipora, 14688: flowers pinkish red. Pagi, 14636; fruit brown.

Sapindaceae.

Allophylus ternatus *Lour.* Siberut, 10597. Flowers white; 10 ft. tall.

Guioa diplopetala *Radlk.* Siberut, 14594. Flowers white; 20 ft. high.

Sabiaceae.

Meliosma lanceolata *Bl.* Sipora, 14764. Flowers pale yellowish green; fruit red; 20 ft. high.

ANACARDIACEAE.

Buchanania insignis *Engler*. Siberut, 14585. Flowers white; 5 ft. high.

Campnosperma macrophylla *Hook. fil.* Siberut, 14566; fruit green; 20 ft. tall.

CONNARACEAE.

Rourea pubinervis *Planch*. Sipora, 14775. Flowers greenish yellow; creeper.

LEGUMINOSAE.

Vigna retusa *Walp*. Sipora, 14560. Flowers yellow.

Mucuna gigantea *DC*. Sipora, 14671. Siberut, 14535. Flowers pale green; fruit green with brownish pubescence; creeper.

Millettia sericea *Benth*. Sipora, 14758. Pods velvety; creeper.

Dalbergia tamarindifolia *Roxb*. Siberut, 13079. Flowers pink or white.

Pongamia glabra *Vent*. Sipora, 14796. Flowers pink; 10 ft. high.

Derris uliginosa *Benth*. Siberut, 14533. Flowers white, buds tinged pink.

D. elliptica *Benth*. Sipora, 14738. Flowers white to pink, reverse brown.

Aeschynomene indica *Linn*. Siberut, 14534. Flowers yellowish to pinkish.

Spatholobus ferrugineus *Benth*. Sipora, 14808. Flowers crimson.

Canavalia obtusifolia *DC*. Siberut, 14528. Flowers pink and white.

Uraria crinita *Desv*. Sipora, 14812. Flowers purplish.

Desmodium umbellatum *DC*. Siberut, 14531. Sipora, 14786.

D. polycarpum *DC*. Siberut, 14473. Sipora, 14726. Flowers purple.

Cassia alata *Linn*. Sipora, 14816. Flowers yellow.

Bauhinia lucida *Wall*. Siberut, 14561. Flowers orange or red; creeper.

Entada Schefferi *Ridl*. Siberut, 10597. Fruit green and brown (unripe); creeper.

Pithecolobium lobatum *Benth*. Siberut, 14554. Flowers yellow; 15 ft. high.

P. Prainianum *Merrill*. Siberut, 14602. Flowers white; 20–30 ft. high.

Myrtaceae.

Eugenia pseudo-formosa *King*. Siberut, 14491.

E. zeylanica *Wight*. Siberut, 14536.

Barringtonia racemosa *Roxb*. Sipora, 14784: flowers greenish-yellow to crimson. Siberut, 14577: flowers pink; 10 ft. high.

Melastomaceae.

Melastoma malabathricum *Linn*. Siberut, 12287.

M. imbricatum *King*. Siberut, 13093. Flowers pink.

Medinilla alternifolia *Bl*. Sipora, 14827. Flowers pink.

M. venusta *King* var. **grandifolia** *Ridl*. n. var.; foliis oblongis, 30–36 cm. longis, 15 cm. latis; cyma sessili.

Siberut, 14545. Flowers white, blotched violet.

The great size of the leaves, as big as those of *M. speciosa*, is remarkable. The only cyme on the specimen is sessile, but sessile cymes do occur on King's type of the species.

Dissochaeta gracilis *Bl*. Sipora, 14661. Flowers white, buds dull purple.

D. intermedia *Bl*. Siberut, 12282. Flowers pale lilac; creeper.

Anplectrum pallens *Tri*. Siberut, 13082; 14096. Flowers violet.

Pachycentria tuberculata *Korth*. Siberut, 11445. Flowers white, centre red; tuber brown.

Pogonanthera pulverulenta *Bl*. Siberut, 14541. Flowers pinkish; creeper.

Memecylon heteropleurum *Bl*. Sipora, 14743. Flowers pink; stamens white and purple; 20 ft. high.

Pternandra echinata *Jack*. Siberut, 14558. Flowers violet, centre yellow.

Rhizophoraceae.

Bruguiera gymnorhiza *Lam*. Siberut, 12296. 10 ft. high.

Anisophylleae.

Anisophylla disticha *Baill*. Siberut, 14077. Fruit crimson.

Legnotidae.

Gynotroches axillaris *Bl*. Sipora, 14761. Flowers yellowish to greenish white.

Combretaceae.

Lumnitzera coccinea *Wight*. Siberut, 13294: seashore; flowers blood-red; 25 to 30 ft. tall. Sipora 14761: flowers carmine; 30 to 40 ft. tall.

LYTHRACEAE.

Lagerstroemia ovalifolia *Teysm. & Binn.* Siberut, 12300.

Sonneratia caseolaris *Merrill.* Siberut, 14526. Flowers crimson.

ONAGRACEAE.

Jussieua suffruticosa *Linn.* Siberut, 13094. Flowers yellow; 4 ft. high.

J. erecta *Linn.* Siberut, 14097. Flowers yellow.

PASSIFLORACEAE.

Adenia populifolia *Engl.* Siberut, 14493.

CUCURBITACEAE.

Trichosanthes tricuspidata *Lour.* Siberut, 14456.

BEGONIACEAE.

Begonia Forbesii *King.* Sipora, 14652. Flowers white; reverse of leaf green.

B. bracteata *Jack—B. lepida* Bl. Sipora, 14779: flowers white, tinged pink; reverse of leaf dull crimson, above brown green. Sipora, 14685: flowers white to pink. Siberut 10582: flowers pink.

From Jack's description I have little doubt that this is the plant he intended, and the Buitenzorg botanists identify the Javanese specimens with Blume's *B. lepida*. It is plentiful in Java. Kloss' specimens have longer acuminate points and longer teeth to the leaf, but I have seen traces of this in Javanese plants. The leaves of both Sumatran and Javanese plants are sometimes quite entire.

B. atricha *Miq.* Sipora, 14653. Leaf spotted white, reverse red with green veins.

I take this, from description, to be Miquel's *B. atricha*, collected in Palembayan, Sumatra, by Teysmann. Miquel is doubtful as to whether the male flowers have 4 perianth lobes; in the Sipora plant there are only two, quite round, and 5 mm. wide. He speaks of the fruit as turbinate. I should call it rather kite-shaped obtriangular, 4 cm. long, 2.5 cm. wide.

DATISCACEAE.

Octomelis sumatrana *Miq.* Siberut, 14625. Fruit brown; 70 to 80 ft. tall.

RUBIACEAE.

Uncaria ovalifolia *Roxb.* Siberut, 14539. Flowers green (monstrous).

Sarcocephalus Junghuhnii *Miq.* Sipora, 14833. Height 30 ft.

Mycetia minor *Ridl.* n. sp.; *M. javanicae* Hook. fil. affinis sed hirtior et omnino minor.

Fruticulus; *caulibus* ad basin albis glabris, partibus juvenibus hirtis; *foliis* herbaceis lanceolatis vel oblongo-lanceolatis cuspidato-acuminatis basibus angustatis, nervis 10-paribus, superne sparse hirtis, pilis multi-cellularibus, subtus in costa nervisque dense hirtis, 9 cm. longis, 4.5 cm. latis; petiolis dense hirtis 1 cm. longis; *stipulis* ovato-triangularibus acutis, glabris, inflorescentia axillari, 1 cm. longa, pedunculo brevi; verticillo *bractearum* 4 lanceolatarum; *cyma* umbellata florum 7 pedicellatarum, *bracteolis* ad basin pedicellarum verticillatis; *calycis* tubo globoso, lobis ovatis-triangularibus acuminatis; *corolla* et *stamina* desunt; *bacca* (in sicco) 2 mm. longa.

Sipora, 14686. Flowers yellow also white.

Hedyotis congesta *Br.* Siberut, 14090. Flowers white; 5 ft. high.

Hedyotis resupinata *Ridl.* n. sp.; affinis *H. venosae* Bl. diversa florum cymulis pedunculatis, a *H. vestita* R. Br. foliis subglabris floribus albis differt.

Herba prostrata, reptans, pilosa; *foliis* ovatis basibus breviter attenuatis glabris, costa et nervis 5-paribus ascendentibus scabrido-hirtis subtus exceptis, 4 cm. longis, 2 cm. latis; petiolis 4 mm. longis hirtis; *stipulis* basibus campanulatis setis longis hirtis, 4 mm. longis; *cymis* axillaribus 1 cm. longis; pedicellis 5 mm. longis, gracilibus; cymulis in ramis gracilibus 2 vel 3, trifloris; *floribus* albis sessilibus; *bracteis* linearibus angustissimis; *calyce* scabrido, lobis 4 lanceolatis acuminatis, tubo longioribus, marginibus et dorsis spinulosis; *corolla* brevi alba, puberula, lobis rotundatis; *staminibus* 4, filamentis brevibus filiformibus, antheris oblongis atris; *stylo* crasso; *capsula* bicocca, lobis magnis persistentibus verrucosula; *seminibus* pluribus atris.

Siberut, 14494. Flowers white.

Polycycliska *Ridl.* n. gen.; *Coptophyllo* Miq. affinis differt inflorescentia cylindrica verticillorum plurimorum bractearum flores umbellatos pedicellatos parvos cingentium.

Fruticulus simplex; *foliis* herbaceis; *spica* terminali cylindrica *bractearum* verticillorum flores pedicellatos cingentium dense congestorum; *floribus* per-parvis albis; *calycis* lobis 5 ovatis; *corollae* tubo brevissimo, lobis 5 ovato-oblongis; *staminibus* 5, antheris oblongis, filamentis brevissimis; *stigmate* bilobo; *disco* majusculo pulviniformi; *capsula* bicocca hirta pedicellata, coccis muris; *seminibus* plurimis atro-brunneis reticulatis. Species 1.

Polycycliska cylindrica *Ridl.* n. sp.

Fruticulus 21 cm. altus, *caule* lignoso superne furfuraceo; *foliis* herbaceis elliptico-lanceolatis acuminatis integris ad bases angustatis, nervis ascendentibus 13-paribus, secundariis brevioribus

ferme aeque conspicuis, nervulis paucis undulatis ramosis subtus conspicuis, 15–18 cm. longis, 4–5 cm. latis; petiolis 1–2 cm. longis; *stipulis* papyraceis oblongo-lanceolatis cuspidatis 1 cm. longis; *spica* cylindrica densa, 2 cm. longa, 1 cm. crassa; *bracteis* lanceolatis acuminatis marginibus hirtis verticillatis; *bracteolis* similibus angustioribus; *floribus* parvis circiter 8–9 in verticillo bracteolarum albis brevissime pedicellatis; *calyce* sparse hirto, lobis 5 ovatis marginibus ciliatis; *corollae* tubo brevissimo, lobis ovato-oblongis obtusis; *staminibus* 5 brevibus; antheris oblongis, filamentis brevissimis; *stylo* longiore; *stigmate* bilobo; *disco* majusculo pulviniformi; *capsula* bicocca hirta in pedicello accrescente 2 mm. longo coccis crustaceis duris; *seminibus* copiosis atro-brunneis scrobiculatis.

Siberut, 11489 (type); Sipora, 14684. Flowers white.

This little plant belongs to the group represented by *Coptophyllum* Miq. and *Pomazota* Ridl. It is distinguished by the whorls of bracts containing numerous, very small flowers, condensed into a cylindric spike and not on a large flat head as in *Coptophyllum*.

Coptophyllum capitatum *Miq.* Siberut, 14517. Flowers white. A small specimen.

Ophiorrhiza filistipula *Miq.* Siberut, 11436; flowers yellowish. Sipora, 14644; flowers white.

Xanthophytum Villarii *Vidal.* Siberut, 13077. Flowers green; 10 ft. tall.

This plant exactly resembles the Philippine Islands plant except that its leaves are wider, 3 cm. across. It is unusually tall for the genus.

Argostemma montanum *Bl.* var. ? Siberut, 11429. Flowers white, tipped with violet.

I am a little in doubt as to this identification as the corolla and stamens are missing in the specimen, and the species is only known as yet from Java, but it resembles nothing else.

A. boragineum *Bl.* Sipora, 14695. Flowers white.

This is apparently var. *breviflora* Ridl. which I collected in Berastagi, but the corolla is missing.

Urophyllum streptopodium *Wall.* Siberut, 11449. Flowers greenish yellow; 8 ft. high.

U. macrophyllum *Korth.* Siberut, 14523. Height 10 ft.

Zuccarinia cordata *Ridl.* n. sp.; affinis *Z. macrophyllae* Bl. in foliis cordatis, petiolis brevibus, seminibus paucis distincta.

Arbor? glabra, ramis crassiusculis; *foliis* subcoriaceis oblongis vel ovato-lanceolatis acuminatis, basibus rotundatis cordatis, nervis ad 13-paribus subtus elevatis gracilibus, 24 cm. longis, 15 cm. latis; petiolis crassis 1.5 cm. longis; *stipulis* lanceolatis e basibus latis acuminatis, carinatis 3.5 cm. longis basibus 1.5 cm. latis; *pedunculis* axillaribus 1.5 cm. longis crassis; *capitulis* subglobosis 1 cm. longis; *bracteis* magnis rotundatis obtusis coriaceis,

bracteolis 2 ovatis ciliatis margine uno connatis; *floribus* 3 mm. longis sessilibus; *calycis* tubo subcylindrico, lobis brevibus ovatis marginibus ciliatis; *corollae* tubo brevi, lobis ter longioribus oblongis obtusis carnosis; *antheris* 5 oblongis majusculis, tubo corollae dorsis adnatis; *stylo* cylindrico angulato; *stigmate* punctiformi; *disco* annulari; *bacca* elliptica 2 cm. longa, 1 cm. in diametro in pedicello 2 mm. longo, obscure 5-costata disco plano terminata, uniloculari; *seminibus* planis costatis flavescentibus paucis 4–5.

Sipora, 14641.

This curious plant (probably a tree) is the second species known of the genus, the other one *Z. macrophylla* Bl. being a native of Java. The latter has ovate leaves, with an entire base, thinner and long petioles. The seeds in the only fruit of *Z. cordata* which I could examine were only 4 or 5, in *Z. macrophylla* they are numerous.

Lecananthus erubescens *Jack*. Siberut, 14620. Flowers white; creeper.

Lucinea membranacea *King*. Siberut, 14507. Flowers (i.e. bracts) red; creeper.

Mussaenda hispida *Ridl*. Siberut, 10576.

M. cylindrocarpa *Arech*. Sipora, 14776. Flowers orange and pale yellow.

Guettarda speciosa *Linn*. Sipora, 14785. Fruit green; 15 ft. high.

Timonius sericanthus *Miq*. Siberut, 14575. Flowers yellow; 10 ft. high.

T. Finlaysonianus *Wall*. Siberut, 14520. Flowers white; 10 ft. high.

Tarenna sumatrana *Ridl*. nov. comb.—*Webera sumatrana* Boerl. Sipora 14810. Flowers white; 10 ft. tall.

This quite resembles the figure by Boerlage in Veth's Midden-Sumatra iv. p. 13. His plant was found in Korinchi.

Tarenna sp. In fruit only. Sipora, 14078. Fruit green; 6 ft. high.

Ixora grandifolia *Zoll. & Mor*. Sipora, 14669.

I. coriacea *Br*. Siberut, 14567. Fruit orange to green; 30 ft. high.

I. salicifolia *DC*. var. **variegata** *N.E. Br*. Siberut. Flowers orange red; 6 ft. high.

Ixora cuspidata *Ridl*. n. sp.; species *I. salicifoliae* DC. proxima, sed foliis autem oblanceolatis vel ferme obovatis latis, cuspide longissima.

Frutex glaber; *foliis* tenuiter coriaceis oblongo-oblanceolatis vel elliptico-lanceolatis vel ferme obovatis apice abrupte longe cuspidatis basibus attenuatis, nervis 15–20-paribus parallelis, 14–18 cm. longis (cuspide 3–5 cm. longo) 4–6 cm. latis; petiolis

3–8 mm. longis; *stipulis* connatis in tubo, lobis subulatis; *cyma* terminali multiflora laxo, ramis 2 cm. longis, bracteis lanceolatis acuminatis; *pedicellis* 2 mm. longis; *calyce* 2 mm. longis, lobis lanceolatis; *corolla* tubo gracili 3–4 cm. longo, lobis patentibus lanceolatis acute acuminatis 1.3 cm. longis, 3 mm. latis; *staminibus* brevibus vix exsertis; *stylo* 2 mm. projecto clavato.

Sipora, 14798 (type). Flowers orange.

Borneo, N.W. Lumbedan, *Burbidge*. Sarawak near Kuching, *Haviland* 945; *Haviland and Hose* 3438.

Morinda tinctoria *Linn.* Sipora, 14649. Flowers white; fruit green; 15 ft. high.

Coelospermum scandens *Bl.* Sipora, 14774. Flowers greenish-white; heads of stamens black.

Psychotria sarmentosa *Bl.* Siberut, 10594.

P. viridiflora *Reinwdt.* Siberut, 10577. Flowers white; 5 to 10 ft. tall.

P. stipulacea *Wall.* Siberut, 1415. Height 15 ft.

P. malayana *Wall.* Sipora, 14700. Flowers white.

Psychotria sumatrensis *Ridl.* n. sp.; *P. malayanae* Wall. affinis sed corymbo furfuraceo minore, corollae tubo brevi cylindrico lobis brevibus, staminibus inclusis, foliis vix ad bases attenuatis.

Frutex glaber, *foliis* coriaceis ellipticis acuminatis, basibus brevissime attenuatis, nervis 16-paribus conspicuis vix elevatis, 20 cm. longis, 9 cm. latis; petiolis 2 cm. longis; *stipulis* ovato-lanceolatis cuspidatis 8 mm. longis; *corymbis* terminalibus, in pedunculis 3–5 cm. longis furfuraceis, pubescentibus congestis 2 cm. longis, 4 cm. latis; *bracteis* ovatis; *floribus* congestis glabris; *calyce* cupulato, dentibus minutis 5; *corollae* 5 mm. longo tubo cylindrico; lobis recurvis apicibus incurvis brevissimis; *staminibus* 5, filamentis in medio corollae insertis brevibus basi pilosis; antheris linearibus demum extrusis; *stylo* brevi demum producto; *stigmate* bifido.

Sipora, 14666. Flowers yellowish-white; fruit dull crimson.

This belongs to the *Grumilea* section of shrubby Psychotrias with corymbs of white flowers. The short tubular corolla with the points of the lobes recurved outwards, and the actual tips of the petals curved into the flower is somewhat unusual.

Streblosa microcarpa *Ridl.* Siberut, 13090. Flowers white.

S. hirta *Ridl.* Sipora, 14663. Flowers white.

Chasalia curviflora *Thw.* Sipora, 14834. Flowers white; fruit purplish black.

Lasianthus mollis *Ridl.* Siberut, 14546. Flowers pale yellow.

This slightly differs from the plant I originally found in Malacca in having fewer leaf-nerves, and smaller bracts. The fruit when dry is strongly lobed.

L. inaequalis *Bl.* Siberut, 14510. Flowers whitish.

Hydnophytum formicarum *Jack* var. Siberut, 14563. Flowers white.

This specimen has no flowers or fruit. The leaves are stiff, obovate with quite round tips and very inconspicuous nerves, 6 cm. long, 4.5 cm. wide or less, the terminal ones on the shoots are elliptic in shape. I have seen no other specimens nor is there any figure in Beccari's Malesia, vol. ii. at all resembling this in foliage.

Myrmecodia echinata *Jack.* Siberut, 12299. Flowers white.

Compositae.

Vernonia javanica *Bl.* Siberut, 14631. Flowers white (i.e. pappus); 30 to 35 ft. high.

Blumea chinensis *DC.* Siberut, 14072. Flowers yellow.

Wedelia biflora *DC.* Sipora, 14791. Flowers yellow.

Erechtites valerianaefolia *DC.* Siberut, 14546. Fruit white.

Eclipta alba *Hassk.* Siberut, 14480. Flowers white.

Lobeliaceae.

Scaevola Koenigii *Vahl.* Siberut, 12298. Flowers white; 30 ft. high.

Vacciniaceae.

Vaccinium Hasselti *Miq.* Siberut, 14603. Flowers pink.

V. acuminatissimum *Miq.* Sipora, 14809. Flowers greenish-white, calyx and stems red.

Ericaceae.

Rhododendron longiflorum *Lindl.* Siberut, 14094. In fruit only.

Myrsinaceae.

Maesa macrothyrsa *Miq.* Sipora, 14756. Creeper.

M. membranifolia *Mez.* Sipora, 14642. Flowers white.

Ardisia macrophylla *Reinwdt.* Sipora, 14740. Flowers white; 15 ft. high.

Ardisia latipes *Ridl.* n. sp.; subsimilis *A. biniflorae* Ridl. panicula longiore multiflora ramis basibus dilatatis, foliis coriaceis paucis ad apices, omnibus specibus distincta.

Frutex 1.5–3 m. alta, *caule* applanato valida, ramis patentibus superne teretibus basibus complanatis triangularibus, 20 cm. longis; *foliis* paucis terminalibus coriaceis glabris lanceolatis vel elliptico-lanceolatis acutis basibus cuneatis, fusco-punctatis, nervis 12-, 13-paribus, secundariis 1 inter paribus omnibus, nervulis pluribus flexuosis, reticulationibus majoribus, omnibus in utro

latere elevatis, costa crassa, 7–12 cm. longis, superne sulcatis; *paniculis* terminalibus, 3–4 cm. longis; *bracteis* ovatis; *pedicellis* crassis 3 mm. longis; *sepalis* ovatis rotundatis marginibus pallidis fimbriatis, glandulis pluribus in medio; *corollae* lobis ovatis obtusis, 2 mm. longis, glandulis paucis; *staminibus* eglandulosis corolla aequantibus; *stylo* haud corolla superanti glanduloso.

Siberut, 10579. Flowers pink; 5 to 6 ft. high.

This shrub is peculiar in the curiously dilated buttress-like bases of the branches.

Ardisia omalocarpa *Ridl.* n. sp.; species *A. pentagonae* DC. approximata in drupa superne deplanata, seminibusque applanatis differt; *A. ferruginea* Mez etiam affinis sed drupa in ea globosa.

Frutex, ramis gracilibus dense ferrugineo-furfuraceis; *foliis* lanceolatis obtuse acuminatis basibus angustatis acutis, tenuiter coriaceis superne laevibus, subtus rufescentibus (in sicco) squamulis rufescentibus tectis, nervis tenuibus indistinctis 10-paribus arcuantibus, 7 cm. longis 1.5 cm. latis; petiolis 3 mm. longis ferrugineo-furfuraceis; *panicula* terminali gracili furfuracea, 3 cm. longa; *cymis* paucis; *floribus* paucis albis, pedicellis 5 mm. longis glabris; *bracteis* minutis lanceolatis acutis; *sepalis* ovato-lanceolatis acutis 1 mm. longis; *corolla* et *stamina* desunt; *drupa* superne depressa obscure 10-lobata, basi angustata, 3 mm. longa, 4 mm. lata.

Siberut, 14095. Flowers white.

This species is peculiar in the shape of the fruit and seed. The drupe is flat and depressed at the top, wider than long and obscurely ten-lobed, the base is narrowed into a kind of pseudo-stalk, the seed flat, round and bun-shaped. Nearly all the fruits and seeds of this large genus are globose. There is however, a parallel to this peculiar fruit in *Ardisia pentagona* DC. of Hongkong.

Labisia pothoina *Lindl.* Siberut, 14075; flowers pale lilac. Sipora, 14746; flowers white.

Aegiceras majus *Gaertn.* Siberut, 13074; flowers white.

Sapotaceae.

Madhuca lanuginosa *Ridl.* n. sp.; species *M. erythrophyllae* Lam. affinis foliis oblanceolatis glabris nervis pluribus differt.

Arbor magna; *foliis* coriaceis glabris oblanceolatis acuminatis acutis, basibus cuneatis, nervis 18-, 20-paribus subtus elevatis, nervis secundariis brevibus, nervulis paucis inarcuantibus, reticulationibus laxis, 15 cm. longis, 5–6 cm. latis; petiolis 1 cm. longis basibus incrassatis primo lanuginosis mox glabris; *floribus* infra folia fasciculatis densis; *pedicellis* crassis ferrugineo-lanatis 1 cm. longis; *bracteis* brevibus ovatis coriaceis glabris; *sepalis* 4, exterioribus crasse coriaceis ovatis mucronatis ferrugineo-lanatis 5 mm. longis, interioribus 2 lanceolatis acuminatis tenuioribus, hirtis brevioribus; *corollae* tubo brevi lobis 6, oblongis obtusis extus hirtis, aequilongis; *staminibus* 20–30, filamentis nullis,

antheris linearibus, loculis ad apices et bases liberis; *ovario* conico; *stylo* validulo sepalis breviore.

Siberut, 10600.

This certainly resembles most closely *M. erythrophylla* Lam. (*Bassia erythrophylla* King and Gamble) of Penang, of which however, we only know the fruits, but the leaves are rather smaller with closer nerves and a different nervation.

STYRACEAE.

Symplocos celastrifolia *Griff.* Siberut. Flowers white; stamens pinkish; large tree.

S. fasciculata *Zoll.* Pagi, 14639. Fruit green; 5 to 10 ft. high.

EBENACEAE.

Maba carpinifolia *Ridl.* n. sp.; *M. sumatranae* Miq. affinis sed foliis multo tenuioribus nervis prominentibus minus hirtis, paniculis longioribus et laxioribus.

Frutex 3 m. ramis gracilibus, pilis rufescentibus appressis tectis; *foliis* alternis herbaceis lanceolato-ellipticis acuminatis basibus angustatis subacutis vel obtusis, nervis subtus multo elevatis hirtis 6–8-paribus, costa subtus prominente appresse hirta superne depressa, 5.5 cm. longis, 2–2.5 cm. latis; petiolis hirtis 2 mm. longis; *paniculis* masculis 2 cm. longis hirtis; *floribus* circiter 12 flavescentibus parvis; *bracteis* lanceolatis acutis acuminatis brevibus; *pedicellis* vix longioribus; *calyce* campanulato, lobis 3 acutis hirtis; *corolla* 5 mm. longa tubulosa basi dilatato, lobis ovatis acutis appressis sericeis; *staminibus* 12, 3 brevissimis, 9 longioribus, antheris lanceolatis mucronatis, filamentis gracilibus; *pistillodio* conico acuminato. *Flores feminei* desunt.

Siberut, 14564. Unopened flower yellowish; 10 ft. high.

APOCYNACEAE.

Chilocarpus aurantiacus *Ridl.* n. sp.; ab omnibus speciebus descriptis distinctis in paniculis elongatis axillaribus.

Frutex scandens glabra, *caule* obscure tetragona; *foliis* coriaceis obovato-oblanceolatis basibus longe angustatis, nervis 15-paribus gracilibus subtus elevatis in intramarginali arcuantibus, 7 cm. longis, 2 cm. latis, petiolis 5 mm. longis; *paniculis* axillaribus, 8 cm. longis; *bracteis* ovatis brevissimis; *pedicellis* 2 mm. longis; *calycis* lobis oblongo-ovatis imbricatis apicibus rotundatis; *corolla* 8 mm. longa, tubo cylindrico basi dilatato petalis ovato-rotundis contortis, squamis in fauce nullis; *antheris* in basi tubi basibus bifidis; *stylo* brevi; *stigmate* parvo pulvinato; *capsula* lignosa oblonga, valvis 4 cm. longis, 1.5 cm. latis, 2 mm. crassis; *seminibus* copiosis nigris in pulpo immersis.

Siberut, 14580. Flowers orange; creeper.

Allied to an undescribed Borneo species, *Haviland* 2299 and *Beccari* 2018, but the nervation is different, and flowers larger and dilate at the base.

Rauwolfia spectabilis *Miq.* Sipora, 14730. Flowers white.

Alyxia selangorensis *King & Gamble.* Siberut, 14089. Fruit green.

Cerbera lactaria *Ham.* Siberut, 14525. Flowers white.

Vallaris lancifolia *Hook. fil.* Siberut, 14612. Flowers white; creeper.

Parsonsia spiralis *Wall.* Siberut, 14466. Flowers white, blotched brown.

ASCLEPIADACEAE.

Sarcolobus globosus *Wall.* Siberut, 14537. Flowers green with brown markings.

Tylophora tenuis *Bl.* Siberut, 14467. Flowers dull crimson.

Hoya multiflora *Bl.* Siberut, 14477. Flowers waxy-white, tipped with yellow.

H. lasiantha *Bl.* Siberut, 14512.

Hoya variifolia *Ridl.* n. sp.; *H. parviflorae* Wt. affinis, gynostemio in toto differt, lobis coronae obtusis bifidis, foliis dimorphis.

Scandens gracilis internodiis longis, *foliis* carnoso-coriaceis dimorphis ellipticis obtusis, basibus angustatis, 1.5 cm. longis, 5 mm. latis, atque lineari-lanceolatis utrinque acuminatis 4 cm. longis, 2 mm. latis, petiolis vix distinctis; *umbellis* 18-floris; *pedunculis* gracilibus 2 cm. longis; *pedicellis* 1 cm. longis; *floribus* 2 mm. latis brunnescentibus; *sepalis* oblongis obtusis glabris; *corollae* lobis ovatis superne velutinis; *gynostemio* brevi, lobis coronae carnosis oblongis obtusis bifidis, inferiore concavo superiore, breviore deflexo, oblongo obtuso; *antheris* brevibus lineari-oblongis; *pistillo* conico; *stylo* brevi; *stigmate* parvo rotundato.

Sipora, 14793. Flowers pinkish and brownish.

Dischidia hirsuta *DC.* Siberut, 10590.

BORAGINACEAE.

Tournefortia tetrandra *Bl.* Siberut, 13080. Flowers greenish white; creeper.

CONVOLVULACEAE.

Ipomoea pes-caprae *Roth.* Siberut, 1444. Flowers purple, base white.

SOLANACEAE.

Solanum parasiticum *Bl.* Sipora, 14769. Flowers white.

Physalis pubescens *Linn.* Siberut, 13096. Flowers pale yellow, centre chocolate.

SCROPHULARIACEAE.

Limnophila villifera *Miq.* Siberut, 14478. Flowers mauve.

Aeschynanthus radicans *Jack.* Siberut, 10586. Flowers red.

Didissandra minor *Ridl.* n. sp.; *D. elongatae* Clarke affinis, sed multo minore, sepalis angustioribus.

Herba 8–15 cm. alta, hirta, *foliis* ovatis vel ellipticis obtusis, basibus rotundatis vel breviter cuneatis superne glabris vel sparse hirtis, pilis multi-cellularibus, subtus in marginibus et costa nervisque 6-paribus hirtis, nervulis transversis paucis, 4 cm. longis, 2.5 cm. latis; petiolis hirtis inferioribus 2 cm. longis, superioribus brevibus; *racemis* 6-floris gracilibus hirtis 4.5 cm. longis; *floribus* parvis albis binis, *pedicellis* brevissimis; *sepalis* 5 linearibus acuminatis hirtis 2 mm. longis; *corollae* tubo glabro, 3 mm. longo, lobis superioribus brevibus oblongis, labio inferiore oblongo multo longiore bilobo, lobis rotundatis; *staminibus* 4, binis, filamentis quam tubum corollae longioribus spiraliter tortis; *stylo* breviore; *stigmato* parvo bilobo; *capsula* angustissima lineari acuminata pubescente.

Siberut, 10591. Flowers white.

This may be a form of *D. elongata*, Clarke, Cyrtand. p. 67; *Didymocarpus elongatus* Jack, Trans. Linn. Soc. xiv. 37.

Loxonia acuminata *Bl.* Siberut, 14519; flowers white, blotched red; the plant is less hairy than usual. Sipora, 14689; flowers pale green to white.

Cyrtandra oblongifolia *Benth.* Siberut, 14456; flowers white. Sipora, 14804; flowers white, bracts dull crimson within, pinkish green outside.

Cyrtandra chiritoides *Ridl.* n. sp.; affinis *C. integrifoliae* Clarke sed caule erecto, petiolis brevioribus, floribus majoribus differt.

Fruticulus lignosus gracilis 18 cm. altus, *foliis* alternis herbaceis tenuibus ovatis vel lanceolatis breviter obtuse acuminatis basibus rotundatis vel breviter cuneatis, nervis inconspicuis 4-paribus puberulis vel hirtis, marginibus obscure serrulatis hirtis, 5.5–7 cm. longis, 3.5 cm. latis; petiolis inferioribus gracilibus, 9 cm. longis, superioribus 3 cm. longis hirtis; *glomerulis* axillaribus trifloris in bracteis 2 ad basin connatis lanceolatis pubescentibus 5 mm. longis; *calyce* tubuloso 5 mm. longo, lobis 2 acuminatis inaequalibus hirtis; *corollae* albae tubo basi tubuloso 1 cm. longo superne dilatato infundibuliformi 1 cm. longo lobis ovatis acuminatis, extus longe hirtis in dorsis et marginibus intus glabris 5 mm. longis, limbo 2 cm. lato; *staminibus* 2 brevibus; *stylo* vix 5 mm. longo; *bacca* cylindrica acuminata 1 cm. longa, 3 mm. crassa suberosa.

Sipora, 14651. Flowers white.

Cyrtandra insularis *Ridl.* n. sp.; species *C. pendulae* Bl. affinis, sed pedunculo brevissimo, foliisque breviter petiolatis differt.

Fruticulus lignosus, *foliis* alternis versus apicem congestis ellipticis vel ovatis acuminatis serratis, basibus cuneatis superne

glabris, nervis 7–8-paribus subtus dense fulvo-hirtis elevatis, 14 cm. longis, 7 cm. latis; petiolis 6 cm. longis dense hirtis; *glomerulis* axillaribus; *pedunculis* 2 mm. longis; *bracteis* 2, ovatis, hirtis 1 cm. longis; *calyce* tubuloso hirto dentibus longis 5 cylindricis 1.5 cm. longis; *corolla* virescente et roseo tincta, tubo basi cylindrico superne infundibuliformi 2.5 cm. longo, lobis ovato-oblongis acutis, omnino extus hirtis 1 cm. longis; *stylo* brevi crasso hirto; *stigmate* magno oblongo papilloso.

Siberut, 13075. Flowers greenish and pinkish.

C. decurrens *De Vr.* Sipora, 14745. Flowers white.

The specimen has shorter petioles than usual and more strongly serrate leaves.

Didymocarpus labiatus *Ridl.* n. sp.; affinis *D. violascenti* Ridl. sed foliis minoribus corolla multo minore glabra, alba.

Herba, caule brevi per-dense pilis brunneis nitidis tecto; *foliis* ovato-ellipticis marginibus crenulatis subacutis basibus obtusis superne pilis longis sparse munitis, subtus costa nervisque 7-paribus et nervulis dense hirtis, 5 cm. longis, 3.5 cm. latis; petiolis 5 mm. longis dense hirtis; *racemo* gracillimo 8 cm. longo hirto; *floribus* albis paucis in paribus; *bracteis* linearibus hirtis; *pedicellis* 5 mm. longis hirtis; *sepalis* 5 lanceolatis liberis acutis extus hirtis 2 mm. longis; *corolla* 5 mm. longa, alba, tubo fere bis sepalis longiore, limbo bilabiato, labio superiore subcucullato inferiore apice rotundato; *staminibus* 2 filamentis tubo corollae longioribus, antheris conniventibus oblongis; *stylo* 5 mm. longo; *stigmate* subpeltato.

Siberut, 13083. Flowers white.

Bignoniaceae.

Dolichandrone Rheedii *Seem.* Siberut, 14550. Height 20 ft.

Acanthaceae.

Staurogyne Griffithiana *Kze.* Siberut, 13099. Flowers white.

S. setigera *Kze.* Siberut, 13100; flowers white and red. Sipora, 14701; flowers white.

Staurogyne citrina *Ridl.* n. sp.; *S. racemosae* Kze. affinis, sed undique glabra foliis longioribus angustioribus in sicco haud erubescentibus, floribus citrinis.

Herba rigida, erecta, 30 cm. alta, vix ramosa, glabra, *foliis* herbaceis lanceolatis acuminatis, basibus longe-attenuatis, nervis 10-paribus gracilibus arcuantibus, 10 cm. longis, 2.6 cm. latis; petiolis gracilibus 1–1.4 cm. longis; *racemo* laxo 10 cm. longo; *floribus* singulis, remotis citrinis; *bracteis* linearibus acuminatis 2 mm. longis pedicellis aequantibus; *sepalis* liberis ferme ad basin 5 linearibus acuminatis; *corolla* 1 cm. longa, basi angustata superne dilatata cylindrica, lobis brevibus aequalibus rotundatis; *staminibus* 4, haud exsertis, antheris ellipticis rotundatis; *stylo* breviore, *stigmate* oblongo lobis 2 lateralibus; *capsula* oblonga 4 mm. longa.

Siberut, 14098. Flowers lemon-yellow.

Certainly nearest to *S. racemosa* Kze. of Penang, but quite glabrous, the stem rather woody, leaves longer and narrower, drying yellowish, the flowers smaller and lemon-yellow; an unique colouring in the genus.

Acanthus ilicifolius *Linn.* Siberut, 12295. Flowers white and violet; 6 ft. high. Unusually tall plants.

Eranthemum ovatifolium *Clarke ms.* Sipora, 14701. Flowers white.

Verbenaceae.

Callicarpa rubella *Lindl.* Siberut, 14464. Flowers lilac.

Premna divaricata *Wall.* Sipora, 14647.

Premna sumatrana *Ridl.* n. sp.; *P. foetidae* Reinwdt. affinis sed foliis minoribus ovatis, calycis dentibus subacutis.

Frutex 3 m. pubescens, *foliis* ovatis cuspidatis basibus latis truncatis, rotundatis vel subcordatis tenuiter coriaceis, glabris vel costa puberula, nervis 6-paribus tenuibus paulle subtus elevatis, 7–10 cm. longis, 5–6 cm. latis; petiolis 2–3 cm. longis puberulis; *corymbo* terminali 4 cm. longo, 4 cm. lato, pubescente; *bracteis* anguste lanceolatis; *calyce* campanulato puberulo, dentibus 5 subacutis, 2 quam alii longioribus; *corollae* tubo campanulato intus lanigero lobis ovatis obtusis; *staminibus* longe exsertis, filamentis gracilibus, antheris ovoideis; *stylo* longo gracili apice incrassato; *ovario* subgloboso; *bacca* globosa, calyce accrescente patelliformi.

Siberut, 14453. Flowers white; 10 ft. high.

The calyx is hardly bilabiate, but two of the teeth are broader, acuter and longer than the other three.

Vitex pubescens *Vahl.* Siberut, 14529. Flowers white and pale purple.

Clerodendron squamatum *Vahl.* Pagi, 14640. Flowers red; fruit green.

Labiatae.

Dysophylla auricularia *Bl.* Siberut, 14532. Flowers white.

Gomphostemma microcalyx *Prain.* Sipora, 14803. Flowers orange-yellow.

There are no flowers on the specimen and the calyx is less woolly than usual, but I think it is this species.

Polygonaceae.

Polygonum barbatum *Linn.* Siberut, 14481. Flowers white.

ARISTOLOCHIACEAE.

Aristolochia Klossii *Ridl.* n. sp.; species *A. ungulifoliae* Mast. affinis, sed foliis ovatis cordatis, labello multo latiore et hirto.

Frutex scandens caulibus costatis 2 mm. crassis internodiis 12 cm. longis; *foliis* ovatis cordatis obtusis chartaceis sinuatis lobis basalibus latis, nervis 5-paribus e sinu subtus elevatis, secondariis et reticulationibus subtus elevatis, 15 cm. longis a basi sinus, 11.5 cm. latis, lobis 3 cm. longis; petiolis 4 cm. longis; *racemis* axillaribus sessilibus 4 cm. longis; *floribus* circiter 15 kermesinis; *bracteis* brevibus ovatis; *pedicellis* cum ovariis 7 mm. longis; *perianthii* tubo basali brevi, 2 mm. longo, parte dilatato ovoideo 7 mm. longo, tubo terminali 1 cm. longo, lateribus oris ovatis erectis, labello elliptico basi angustato mucronulato superne hirto, 2 cm. lato; *staminibus* 6, columna glabra; *stigmatibus* 6 conicis in cupulo undulato.

Sipora, 14767. Flowers deep crimson, white at base; sheath (lip) pinkish, edge crimson.

NEPENTHACEAE.

Nepenthes Reinwardtiana *Miq.* Siberut, 12288. Cup pale green.

N. phyllamphora *Willd.* Siberut, 12286. Cup green and crimson.

PIPERACEAE.

Piper firmum *C. DC.* Siberut, 10595. On a tree; male.

The only specimen I have seen of Miquel's *Muldera firma*, and the only description of it, is that of the female plant which has very small leaves. The Siberut specimen is of a male plant, with much larger leaves of the same texture, and the shape and venation of Miquel's plant; they are oblong-ovate, very stiff, 10 cm. long and 3 to 5 cm. wide. The peppers vary very much in foliage, but I believe this to be the male of Miquel's and Decandolle's plant. The male spike is rather slender, 5 cm. long on a peduncle 3 cm. long, the flowers are very close set, sessile, the edges of the bract-cup rounded, broad, narrowed at the base; stamens 3, in a mass of hair.

P. muricatum *Bl.* Siberut, 13076; flowers white. Sipora, 14748. Fruit greenish orange; 2 feet tall.

In these specimens the leaves are rather narrower than usual.

P. majusculum *Bl.* Sipora, 14799. Flowers pale dull green.

P. crassipes *Korth.* Siberut, 14088. Fruit brown.

P. boehmeriaefolium *Wall.* Sipora, 14792. Flowers white; leaves unusually large.

CHLORANTHACEAE.

Chloranthus officinalis *Bl.* Siberut, 14074. Fruit pale green; 8 ft. high. This is unusually big for this plant.

Horsfieldia Lemanniana *Warb.* Siberut, 14597. Fruit yellow to green; 40 ft. tall.

H. Irya *Warb.* Sipora, 14760. Flowers dull yellow; 40 ft. tall.

H. crassifolia *Warb.* Siberut, 14568. Flowers green; 20 ft. tall.

Knema glauca *Warb.* Siberut, 14496; fruit brown; 10 ft. high. Siberut, 14569; fruit orange brown; 40 ft. high.

K. laurina *Warb.* Siberut, 13092. Flowers red; fruit red; 10 ft. tall.

Myristica maxima *Warb.* Sipora, 14772. Height 40 ft.

LAURACEAE.

Dehaasia microcarpa *Bl.* Siberut, 14457; fruit red; 15 ft. high. Sipora, 14755; ripe fruit scarlet. (These colours no doubt refer to the brilliant coloured peduncle.)

Endiandra crassifolia *Ridl.* n. sp.; specie nullo affinis, a *E. macrophylla* Bl. differt foliis haud minute reticulatis, floribus parvis, staminibus hirtis.

Arbor 5 m. *foliis* coriaceis ellipticis obtusis acuminatis, basibus angustatis cuneatis, nervis 5-paribus superne depressis, subtus elevatis, nervulis paucis subtus elevatis, 18 cm. longis, 12 cm. latis; petiolis crassis 2 cm. longis; *paniculis* pubescentibus laxis 7 cm. longis vel brevioribus; *bracteis* ovatis acutis 1 mm. longis; *pedicellis* 5 mm. longis; *floribus* 2 mm. longis roseo-flavis; *sepalis* ovatis obtusis 3 pubescentibus; *petalis* longioribus 3 ovatis obtusis; *staminibus* 9, antheris bilocularibus, filamentis hirtis; *ovario* oblongo glabro, *stylo* cylindrico; *stigmate* discoideo.

Siberut, 14593. Buds pink and yellow; 15 ft. high.

Litsea sebifera *Bl.* Sipora, 14706. Height 40 ft.

Litsea tenuipes *Ridl.* n. sp.; *L. castaneae* Hook. fil. affinis, differt in foliis majoribus oblongo-lanceolatis et acuminatis, perianthii lobis majoribus pedunculis et filamentis glabris.

Arbor 10 m. *foliis* tenuiter coriaceis, lanceolatis vel oblongo-lanceolatis acuminatis, basibus paullo angustatis obtusis; 21 cm. longis, 6 cm. latis; nervis subtus elevatis 12-, 13-paribus superne depressis, costa superne plana subtus angulata, reticulationibus minutis elevatis subquadratis; petiolis 15 mm. longis; *racemis* pluribus axillaribus infra folia, *pedunculis* gracilibus, glabris 1 cm. longis; *floribus* in capitulo 5 flavis; *bracteis* inaequalibus 2 ovatis, 2 crassioribus et brevioribus, rotundato-cymbiformibus extus sericeo-pubescentibus 4 mm. longis; *pedicellis* brevibus sericeis; *perianthii* lobis oblongo-linearibus glabris; *staminibus* 8, filamentis longis filiformibus glabris basibus dilatatis, glandulis oblongis breviter pedicellatis, antheris quadratis. *Flores feminei* et *fructus* desunt.

Sipora, 14751. Flowers yellow; 30 ft. high.

Loranthus fasciculatus *Bl.* Sipora, 14657. Flowers red; stamens yellow tipped red.

I have not seen a specimen of the Javanese plant, but Blume's figure is quite like the Sipora specimen.

EUPHORBIACEAE.

Actephila javanica *Miq.* Siberut, 10578; fruit green; 8 to 9 ft. high. Sipora, 14667; fruit green; 5 ft. tall.

Cleistanthus pseudo-pallidus *Jabl.* Sipora, 14698. Flowers greenish and yellowish; 10 ft. high.

Glochidion borneense *Boerl.* Siberut, 14588, 14099. Fruit crimson.

Breynia discigera *Müll.* Siberut, 10587, 14559; fruit red; 10 ft. high. Sipora 14813; fruit red; 3 to 4 ft. high.

Baccaurea lanceolata *Müll.* Sipora, 14722. Flowers waxy yellow, petals white.

Antidesma microcarpum *Miq.* Sipora, 14683. Flowers pale brownish; 10 ft. high.

A. tetrandrum *Bl.* Siberut, 14462. Flowers yellow; 10 ft. high.

Galearia phlebocarpa *Hook. fil.* Sipora, 14715. Flowers green.

Ostodes macrophylla *Benth.* Siberut, 14562. Flowers yellow; 30 ft. high.

Trigonostemon indicus *Hook. fil.* Siberut, 14610. Flowers dark red. 5 to 10 ft. high.

Trigonostemon sanguineus *Ridl.* n. sp.; affinis *T. longifolio* Baill. sed foliis lanceolatis basibus angustatis pubescentibus, racemis brevibus.

Frutex 3 m. partibus juvenibus scabride hirtis alabastris sericeis, caulibus cicatricibus petiolaribus ovatis 2 mm. longis ornatis; *foliis* chartaceis lanceolatis acuminatis basibus longe attenuatis glabris, costa utrinque elevata et marginibus rigide pilosis exceptis, nervis 11-,12-paribus paullo elevatis, 26 cm. longis, 8.5 cm. latis; petiolis 6–13 mm. longis hirtis; *racemo* simplice 9 cm. longo hirto; *floribus* subtus 2–3 glomeratis superne singulis; *bracteis* lanceolatis pedicellorum dimidio aequantibus hirtis; *pedicellis* 2 mm. longis hirtis; *floribus* masculis, 6 mm. latis; *sepalis* rotundato-obovatis glabris; *petalis* multo majoribus rotundatis glabris kermesinis; *antheris* in columna 3, bicornutis disco magno cupuliformi. *Flores feminei* et *fructus* desunt.

Sipora, 14697. Flowers very deep crimson; 10 ft. high.

Claoxylum indicum *Hassk.* Sipora, 14711. Flowers pale yellowish.

Wetria trewioides *Bl.* Sipora, 14801. Flowers green.

Mallotus leucocalyx *Müll.* Siberut, 14488; fruit green. Sipora, 14770.

M. cochinchinensis *Lour.* Pagi, 14634. Flowers white; 15 to 20 ft. high.

Blumeodendron Kurzii *Sm.* 14622, 14623. Fruit green; 30 to 40 ft. tall.

The fruit is globose, 4 cm. through, on stalks 1 cm. long; pericarp crustaceous, hard, hardly woody, 2 mm. thick; stigma persistent.

Macaranga tanaria *Müll.* Sipora, 14691. Flowers whitish green with green spikes.

M. Hosei *King.* Siberut, 14580. Male flowers pale yellow; 15 ft. high.

Gelonium multiflorum *Juss.* Sipora, 14177. Flowers greenish white.

Gelonium rubrum *Ridl.* n. sp.; affinis *G. glomerulato* Hassk. differt foliis crassioribus longius acuminatis, capsulis parvis rubris.

Frutex 1.2 m. glaber, ramorum cortice pallido; *foliis* rigide coriaceis ellipticis obtuse cuspidato-acuminatis, basi cuneatis, 10–10.8 cm. longis, 3–5.5 cm. latis, nervis 7, arcuantibus reticulationibus utrinque conspicuis (siccis flavescentibus) utrinque nitidis; petiolis 4 mm.; *floribus* paucis sessilibus in spica quam petiolus breviore bracteis latis ovatis fimbriatis; *capsula* globosa, 5 mm. longa rubra in valvis 3 coriaceis dehiscentibus.

Siberut, 14091. Fruit scarlet; flowers not seen; 5 ft. high.

Clavistylus peltatus *J. J. Sm.* Siberut, 14508. Male flowers yellowish.

Urticaceae.

Gironniera nervosa *Planch.* Siberut. Fruit yellow; 30–35 ft. high.

Conocephalus azureus *Teysm. & Binn.* Siberut, 14549. Flowers buff-coloured.

C. amoenus *Hook. fil.* Siberut, 13085. Fruit (flowers) mauve; creeper.

The leaves are unusually small, but I think this is *C. amoenus*.

Conocephalus oblanceolatus *Ridl.* n. sp.; species affinis *C. subtrinervio* Miq., sed foliis latis obovatis nervisque magis horizontalibus.

Frutex caule 6 mm. crasso, *foliis* obovatis oblanceolatis obtusis, basi cuneatis subtus pallidis, 18 to 25 cm. longis, 10-13 cm. latis, nervis 11-paribus subtus elevatis, petiolis gracilibus 12 cm. longis; *capitulis* singulis 2 cm. in diametro, pedunculis 8 mm. longis; *bracteis* coriaceis ovatis cymbiformibus 5 mm. longis; *stipulis* coriaceis acutis cymbiformibus 1 cm. longis; *floribus*

femineis sessilibus oblongis, tubo perianthii 3 mm. longo, lobis ovatis pubescentibus apicibus incrassatis, ovario ellipsoideo.

Sipora, 14714. Flowers white on mauve; male flowers not seen.

Ficus urophylla *Wall.* Siberut, 14093. Fruit yellow.

F. pisifera *Wall.* Sipora, 14818. Figs green, spotted whitish; creeper.

F. consociata *Bl.* Siberut, 14584; large tree (no figs on the specimen, but I think this identification is correct). Sipora, 14747; creeper; figs orange and yellow, reverse of leaves russett-yellow.

F. globosa *Bl.* Siberut, 14551. Creeper; figs green.

F. chamaecarpa *Ridl.* n. sp.; in floribus femineis haec species *F. Treubii* King. approximat sed in foliis nec cordatis nec inaequilateribus, et multo minoribus differt omnino aliis speciebus cum ramis fructiferis prostratis.

Frutex, ramis subgracilibus, pilis appressis; *foliis* ovatis cuspidatis, basi angustatis, obtusis vix obliquis, superne sparse hirtis costa et nervis subtus densius hirtis, 13 cm. longis, 5 cm. latis; nervis 7-paribus; petiolis 1 cm. longis hirtis: *syconiis* pyriformibus costis 3 elevatis kermesinis, hirtis 1.4 cm. longis, in ramis laevibus glabris nudis fistulosis prostratis, internodiis 16 cm. longis, ramulis hirtis 9 cm. longis; *stipulis* ovatis; *bracteis* ad basin ovatis 2 mm. longis glabris; *floribus* masculis et galliferis non visis; *floribus femineis* brevi stipitatis obovoideis; *stylo* laterali gracili longo, apice hirto; *stigmate* clavato.

Sipora, 14675. Fruit dull crimson on prostrate branches .

This species is very distinct from all of this section of figs in its hardly irregular leaves not distinctly cordate at the base. The female flowers most closely resemble those of *F. Treubii*, but in other respects the plant is quite different.

F. polysyce *Ridl.* Siberut, 10497. Fruit green; 10 to 15 ft. high.

F. Miquelii *Hook. fil.* Sipora, 14674. Fruit green; 15 ft. high.

F. staphylosyce *Ridl.* Siberut, 10496.

Ficus microsyce *Ridl.* n. sp.; affinis *F. staphylosyce* Ridl. differt in foliis latis oblanceolatis basi inaequilateris multo majoribus.

Arbor, ramulis hirtis, *foliis* oblanceolato-ellipticis basibus inaequilateribus scabridis chartaceis marginibus, undulatis et saepe 4-dentibus latis versus apices, 19 cm. longis, 8 cm. latis; nervis 7-, 10-paribus; petiolis brevissimis vix 2 mm. longis hirtis; *syconiis* glomeratis in tuberculis trunci, flavis globosis puberulis, 5 mm. longis, in pedicellis gracilibus brevioribus; *bracteis* nullis, bracteolis in ore syconii ovatis glabris; *floribus masculis*, *sepalis* angustissimis lineari-lanceolatis, *stamine* uno, *galliferis* pro syconio majusculis obovoideo-globosis, pedicellatis; *floribus femineis*,

sepalis 2 lanceolatis acuminatis angustissimis, *ovario* pedicellato ellipsoideo utrinque attenuato curvo, *stylo* longo filiformi.

Siberut, 14609 (type); fruit yellow. Also collected at Sibolangit (North Sumatra), Dato Pulau, Siam valley, *Mohammed Nur* 7206.

F. leucantatoma *Miq.* Sipora, 14817. Figs green; 10 ft. high.

F. lepicarpa *Bl.* Siberut, 13072. Figs green; 10 ft. high. Sipora, 14721; figs dark green; 15 ft. high.

F. ramentacea *Roxb.* Sipora, 14754. Creeper; fruit scarlet.

F. hispida *Linn.* Sipora, 14641. Fruit green; 15–20 ft. high.

F. diversifolia *Bl.* Siberut, 14572; creeper. Sipora, 14573.

F. fulva *Reinwdt.* Siberut, 10495. Height 15 ft.

F. toxicaria *Bl.* Siberut, 10596. Sipora, 14750.

F. alba *Reinwdt.* Siberut, 14475. Sipora, 14782.

F. villosa *Bl.* Siberut, 10593; figs brown. Sipora, 14797; figs bright russet.

Elatostemma longirostre *Ridl.* n. sp.; species *E. integrifolio* Wedd. affinis, foliis subtus hirsutis et marginibus serrulatis differt.

Herba, caulibus elatis gracilibus ramosis, breviter appresse-hirtis; *foliis* alternis oblique ovato-lanceolatis, 13–15 cm. longis, 5 cm. latis, longe acute cuspidato-acuminatis marginibus serrulatis basi rotundatis obliquo superne glabris, subtus dense appresse-hirtis in nervis nervulisque, nervis e basi tribus, nervulis a costa 6-paribus, raphidibus nullis; petiolis 3 mm. longis; *stipulis* obovatis cuneatis tridentatis; *capitulis* sessilibus 1 cm. in diametro glabris; *floribus masculis* pedicellatis acutis.

Siberut, 13098 (type); flowers white. Also Sibolangit, Bukit Kluang (North Sumatra), *Mohammed Nur* 7442.

Pellionia longipetiolata *Ridl.* n. sp.; ab aliis speciebus differt caule lignoso longe repente, foliis haud inaequilateribus basi rotundatis, petiolis longis, sepalis rotundatis reticulatis.

Suffrutex gracilis metralis, parte basali (ut videtur) in truncis arborum reptante; *foliis* 8–12 cm. dissitis alternis ellipticis acuminatis acutis, 11–15 cm. longis, 4–6 cm. latis, nervis 6-paribus, basi rotundatis obtusis subpeltatis glabris, raphidibus in facie superiore copiosis; petiolis gracilibus 5–6 cm. longis; *cyma mascula* laterali 4.5 cm. longa, 5 cm. lata hirta; *sepalis* 5 rotundatis apiculatis hirtis translucente reticulatis; *staminibus* 5 brevioribus, filamentis brevibus et crassis; antheris elliptico-oblongis loculis connectivo latiusculo disjunctis; *floribus femineis* et *acheniis* ignotis.

Sipora, 14624 (type), 14744; flowers pink. A rather smaller state.

Var. **hirta** *Ridl.* n. var.; foliis magis ovatis, basibus latioribus marginibus crenulatis vel undulatis, costis nervisque subtus et petiolis appresse hirtis.

Borneo: Sarawak; Mount Matang, July 1893, *Ridley*.

The Borneo plant has stiffer, more rounded leaves and is hairy, otherwise I see no difference from the other plants.

Pipturus argenteus *Wedd.* Sipora, 14727. Flowers white.

Boehmeria ramosissima *Miq.* Sipora, 14819. Flowers whitish.

Leucosyke capitellata *Wedd.* Siberut, 14471. Albescent; 5 ft. high.

Procris laevigata *Bl.* Sipora, 14696.

ORCHIDACEAE.

Microstylis trinervia *Ridl.* n. sp.; *M. micranthae* Hook. fil. affinis, foliis trinervosis, sepalis petalisque ovatis, labello margine dentato, apice bifido distincta.

Herba repens et radicans 21 cm. longa vel ultra; *foliis* herbaceis circiter 12, elliptico-lanceolatis obtuse acuminatis inaequilateralibus basibus obtusis, 5 cm. longis, 16 mm. latis; nervis 3 multo elevatis; petiolis latis vaginantibus, 1 cm. longis; *racemo* gracili; *bracteis* lineari-lanceolatis acuminatis 2 mm. longis deflexis; *floribus* copiosis minimis flavis, *pedicellis* quam bracteae brevioribus; *sepalis* ovatis subacutis; *petalis* ovatis acutis; *labello* lato rotundato auriculato, fovea magna, dentibus 2 vel 3 brevibus, uno longiore in utroque margine, lobo medio subtriangulari bifido, dentibus longis acutis; *columna* brevi, stelidiis porrectis acutis.

Sipora, 14655. Flowers yellow.

The flower-spike in the specimen is very young, and the flowers in bud only. The plant being covered with mud is evidently a creeper on muddy banks, as is the allied *M. nemoralis Ridl.* The three nerves on the leaf are remarkably prominent beneath.

M. congesta *Rchb. fil.* Sipora, 14654. Flowers dull crimson.

Liparis Klossii *Ridl.* n. sp.; *L. pallidae* Lindl. affinis, sed floribus minoribus bracteisque brevioribus.

Epiphyta, *pseudobulbis* 3 elongatis basibus dilatatis, 3 cm. to 4 cm. longis; *folio* coriaceo oblongo-lanceolato subacuto, basi attenuato, basi attenuato 10-nervio, 22 cm. longo, 3 cm. lato; *racemo* 19 cm. longo gracili; *floribus* remotis circiter 40 obscure rubris; *bracteis* tenuibus lanceolatis acuminatis 3 mm. longis; *pedicellis* cum ovariis ferme 1 cm. longis; *sepalis* oblongo-obtusis deflexis 3 cm. longis, 1 mm. latis; *petalis* linearibus angustioribus; *labello* 5 mm. longo, 4 mm. lato obcuneato bilobo, basi lineari, carinis carnosis paullo elevatis in ungue, lobis rotundatis dentibus pluribus brevissimis obtusis in marginibus; *gynostemio* sigmoideo dimidio labello aequante; stelidiis brevibus obtusis latis.

Siberut, 14502. Flowers dull red.

This is allied to *L. pallida* Lindl., but the flowers are considerably smaller, and the bracts shorter.

Liparis dissitiflora *Ridl.* n. sp.; *L. pallidae* Lindl. affinis sed floribus dissitis parvis, labello bilobo nec denticulato.

Epiphyta, pseudobulbis oblongis basibus dilatatis 2 cm. longis 4 mm. crassis; *foliis* 2 tenuiter coriaceis oblanceolatis acutis elongatis basibus angustatis 6–15 cm. longis, 1 cm. latis; *racemo* gracili 13 cm. longo; *floribus* remotis parvis rubris et albis; *bracteis* papyraceis lanceolatis acuminatis 2 mm. longis; *pedicellis* gracilibus longioribus; *sepalis* oblongis obtusis; *petalis* brevioribus ovatis; *labello* basi carnoso oblongo, lateribus elevatis, lobo medio rotundato bilobo, callis 2 ad basin labelli; *gynostemio* apice curvo, stelidiis rotundatis.

Siberut, 14632. Flowers red and white.

Dendrobium subulatum *Hook. fil.* Sipora. Flowers white tinged with pink, yellow patch on lip.

D. sinuatum *Lindl.* Siberut, 14538. Flowers yellowish with brown markings.

Bulbophyllum apodum *Hook. fil.* Siberut, 14608. Flowers white.

Bulbophyllum (Cirrhopetalum) Klossii *Ridl.* n. sp.; species *B. eleganti* J. J. Sm. affinis, differt pedunculo brevi, sepalis petalisque acuminatis haud setiferis, sepalis lateralibus angustioribus.

Epiphyta, rhizomate gracile, *pseudobulbis* ovoideis 4-6 cm. longis, 1 cm. distantibus; *folio* coriaceo elliptice obtuso apice rotundato basi ad petiolum attenuato, 4 cm. longo, 1–1.5 cm. lato; *scapo* gracile 6 cm. longo; *floribus* pallide flavis circiter 8 in umbella; *bracteis* lineari-lanceolatis, 2 mm. longis; *sepalo* postico lanceolato longe acuminato apice gracili 2 mm. longo, lateralibus haud connatis lanceolato-linearibus basibus attenuatis apicibus acuminatis trinerviis 15 cm. longis, 2 mm. latis; *petalis* ovato-lanceolatis acuminatis glabris, sepalo postico aequilongis, labello brevi linguiformi carnoso basi lato; *gynostemio* pede longo libero curvo, stelidiis acutis erectis.

Siberut, 14100. Flowers pale yellow.

A fine large flowered species.

Eria floribunda *Lindl.* Siberut, 14490. Flowers white.

Trichotosia calvescens *Ridl.* n. sp.; affinis *T. poculatae* Ridl., floribus multo majoribus foliis et caule ferme omnino glabris.

Epiphyta, caulibus glabris 1.21 m. longis; *foliis* coriaceis lanceolatis acuminatis, basibus obtusis pilis nigris in basibus et marginibus aliter glabris 6–7 cm. longis, 1 cm. latis, vaginis 2–3 cm. latis, pilis nigris in ore; *racemo* brevissimo 1 cm. longo, rachide dense rufo-hirto; *floribus* paucis albescentibus in medio rosaceis; *bracteis* oblongo-ovatis 5 mm. longis, obtusis hirtis; *sepalo* postico lanceolato acuto extus rufo-hirto 1 cm. longo, lateralibus lanceolatis acutis 1 cm. longis, mento scrotiforme; *petalis* linearibus angustioribus glabris; *labello* basi angusto lineari carnoso, costis 2 validulis e basi ad lobum medium lobis lateralibus oblongis acutis,

lobo medio brevi lato rotundato breviter bilobo, lobis obscuris dentatis; *gynostemio* longiusculo sulcato ad pedem, *anthera* calvariformi tridentata.

Sipora, 14834. Flowers whitish-pinkish in centre, lip yellowish brown, base red.

Trichotosia Teysmanni *Kranzl.* Siberut, 14587.

Agrostophyllum bicuspidatum *J. J. Sm.* Siberut. Flowers white, spotted red. It is unusual for this plant to have red-spotted flowers.

Claderia viridiflora *Hook. fil.* Siberut, 12283.

Spathoglottis plicata *Lindl.* Siberut; flowers deep pink. Sipora, 14727; flowers pink.

Coelogyne Rochusseni *De Vriese* var. **plantaginea.**

Siberut, 14615. Flowers pale yellow and deep yellow in centre. This has the narrowed leaves and long pointed lip of Lindley's species *C. plantaginea,* now reduced to a form of *C. Rochusseni.*

Eulophia squalida *Lindl.* Siberut, 13081; flowers greenish russet, hood (upper sepal) white, lip pink. Sipora, 14780; petals greenish, striped brown; lip white, hood pink and brown.

Plocoglottis foetida *Ridl.* Siberut, 14591. Flowers brownish white, spotted brown; lip waxy yellow.

Dipodium paludosum *Rchb. fil.* Siberut, 14553. Petals pale yellow spotted crimson; lip white streaked crimson, centre yellow.

Phalaenopsis sumatrana *Korth.* Sipora, 14773. Flowers white, blotched brown crimson, hood white and mauve.

Trichoglottis retusa *Bl.* Siberut, 14574. Flowers greenish yellow, blotched brown; lip white with crimson markings.

Renanthera micrantha *Lindl.* Siberut, 14570. Flowers crimson. Epiphyte.

Saccolabium pubescens *Ridl.* Siberut, 14501. Flowers pinkish to white. Leaves narrower than usual.

Thrixspermum lilacinum *Rchb. fil.* Sipora, 14752. Flowers white to mauve, red patches on lip.

Dendrocolla cerina *Ridl.* n. sp.; *D. pardali* Ridl. affinis, sed bracteis multo minoribus, flore immaculato.

Epiphyta, caule brevi 5 cm. longo; *radicibus* pluribus; *foliis* crasse coriaceis oblongo-linearibus obtusis inaequaliter bilobis 3.5 cm. longis, 1 cm. latis; *pedunculis* 15–17 cm. longis rigidis; *racemis* tandem 6 cm. longis; *bracteis* plurimis proximis corniformibus apicibus recurvis rigide coriaceis; *pedicellis* 8 mm. longis; *floribus* cereo-flavis 1 cm. latis oblongis tenuibus; *sepalo* postico ovato, lateribus latis; *petalis* brevioribus obovatis rotundatis; *labello* ovato-oblongo (explanato), cuspide longo in apice lato; *gynostemio* brevi lato.

Siberut, 14524. Flowers waxy yellow.

The very thin flowers of the specimen have not preserved very well, and the only column I have seen was too much crushed to describe.

Dendrocolla punctata *Ridl.* n. sp.; affinis *D. carnosae* Ridl. sed foliis multo tenuioribus floribusque maculatis.

Epiphyta, caule gracili 5 cm. longo; *foliis* tenuiter coriaceis linearibus obtusis inaequaliter lobis 7.5 cm. longis 16 mm. latis; *pedunculis* gracilibus 5–6 cm. longis; *racemis* tandem 1 cm. longis; *bracteis* brevibus triangulari-ovatis acutis; *pedicellis* 5 mm. longis; *floribus* 5 mm. latis albis flavo-brunneo-maculatis; *sepalo* postico ovato acuto, lateralibus oblongis apicibus albo-pilosis, calcare brevi conico; *gynostemio* brevi; *anthera* magna cucullata.

Sipora, 14789. Flowers waxy white, spotted golden brown.

Acriopsis javanica *Lindl.* Sipora, 14704. Flowers red and white.

Podochilus sciuroides *Rchb. fil.* Siberut, 14451. Flowers white.

Corymbis veratrifolia *Bl.* Sipora, 14656.

Lecanorchis malaccensis *Ridl.* Siberut, 14595. Flowers white.

Vrydagzynea bractescens *Ridl.* n. sp.; affinis *V. nudae* Bl. differt in forma labelli et bracteis magnis albescentibus.

Herba 15 cm. alta, basi nudo; *foliis* tenuibus herbaceis ovatis acutis basibus cuneatis 2.2 cm. longis, 1 cm. latis; petiolis 2–4 mm. longis; *pedunculo* 4–5 cm. longo, racemo 6–, 8-floro; *bracteis* foliaceis lanceolatis acutis 8 mm. longis; *floribus* albis, ovariis cum pedicellis bracteis brevioribus; *sepalo* postico petalis adnato crasso lanceolato lateralibus lanceolatis obtusis; *petalis* tenuioribus angustis; *labello* oblongo-lineari subspathulato, marginibus basalibus sursum curvis, lobo medio ovato lateribus erectis, costa crassa carnosa e basi labelli ad basin lobi medii calcare elliptico versus apicem obtusum attenuato, glandulis interioribus globosis pedicellis filiformibus fere ad basim calcaris attingentibus; *gynostemio* brevi, lobis lateralibus longis carnosis; *anthera* lanceolata rostrata; *rostello* acuminato integro.

Siberut, 11443. Flowers white.

Zingiberaceae.

Globba variabilis *Ridl.* Siberut, 13095; flowers orange-yellow to orange-red. Sipora, 14658; flower orange-yellow; stems red proximally.

These plants are more hairy than the typical Pahang plant, but I have collected somewhat similar forms in Kelantan.

G. candida *Ridl.* Sipora, 14681. Flowers pale violet-white; calyx white. The original plant collected by me in Berastagi, north Sumatra, had quite white flowers.

Hedychium coronarium *Linn.* Sipora, 14707. Flowers white.

Hedychium longicornutum *Bak.* var. **minor** *Ridl.* n. var.; *epiphyta* 4.7 cm. alta; *floribus* in spica paucis ad 3; *bracteis* lanceolatis angustioribus.

Siberut, 14599 (type); flowers orange; on a hedge-tree. Sipora 14523; fruit orange.

A reduced form of this Malay peninsular plant. Curtis gathered also typical *H. longicornutum* in Sumatra.

Gastrochilus roseo-punctatus *Ridl.* n. sp.; *G. longiflorae* Wall. affinis foliis lanceolatis basibus attenuatis inaequilateris, floribus singulis roseo-punctatis differt.

Herba rhizomate repente 2 cm. longo; *folio* singulo in caule, 4 cm. longo, lanceolato subacuto inaequilaterali longe ad basin attenuato glabro, costa prominente, 21 cm. longo, 4 cm. lato, petiolo gracile 6 cm. longo, vagina 5 cm. longa, ligula bifida, lobis longis lanceolatis acuminatis, 1 cm. longa; *flore* singulo e vagina orto; *calyce* tubuloso, limbo lanceolato 8 mm. longo; *corollae* tubo basi gracili albo 5 cm. longo lobis oblongis obtusis; *labello* saccato-campanulato apice bilobo 1 cm. longo, 7 mm. lato albo intus kermesino-punctato lobis rotundatis filamento gracili; *anthera* lineari.

Sipora, 14693. Flowers white, spotted crimson.

Elettariopsis puberula *Ridl.* n. sp.; species *E. pubescente* Ridl. affinis sed differt in calyce infundibuliformi rigido costato lobis aequalibus.

Herba caule 60 cm. alto, basi vaginis pubescentibus tecto 13 cm. longo; *foliis* 10 oblongo-lanceolatis acuminatis cuspidatis basibus attenuatis superne glabris subtus puberulis 23 cm. longis 3.5 cm. latis superioribus minoribus, nervis copiosis tenuibus approximatis, vaginis costatis pubescentibus; *spica* e basi orta 8 cm. longa ascendente, ramis 2 vel 3, 1 cm. longis; *bracteis* oblongo-lanceolatis striatis mucronulatis 7 mm. longis; *floribus* binis; *pedicellis* gracilibus 6 mm. longis; *calyce* glabro infundibuliformi costato, lobis 3 lanceolatis aequalibus 6 mm. longis; *corollae* tubo calycem vix superantem, lobis lanceolatis 6 mm. longis; *labello* obovato albo 6 mm. lato.

Sipora, 14742. Flowers white.

The flowers of the specimen are very incomplete, but the plant is unlike any other species known to me. The stiff ribbed calyx with equal lobes is peculiar.

Costus speciosus *Linn.* var. **argyrophyllus** *Schum.* Siberut, 10575. Flowers white.

Amomum apiculatum *Schum.* Siberut, 14514. Flowers crimson.

A. lappaceum *Ridl.* ? Siberut, 13084. Fruit reddish orange. Resembles to some extent *A. lappaceum*.

Hornstedtia triorgyale *Bak.* Siberut, 10583; flowers red. Sipora, 14705; flowers crimson and gold.

Hornstedtia parviflora *Ridl.* n. sp.; species distincta ab omnibus minoribus, floribus parvis, labello integro.

Herba rhizomate lignoso 4 mm. crasso; *caule* foliifero 60 cm. alto; *foliis* elliptico-lanceolatis breviter acuminatis basibus attenuatis glabris, 30 cm. longis, 7 cm. latis; petiolis alatis ferme ad bases, 4 mm. longis; vaginis glabris cancellatis; ligula oblonga 4 mm. lata; *spica* a caule foliato distante, 8 cm. longa, 4 cm. crassa, superne dilatata; *bracteis* ovatis rotundatis tenuibus, inferioribus marginibus hirtis superioribus glabris, 2.3 cm. longis 1.4 cm. latis, striatis; *floribus* parvis rubris; *corollae* tubo 4 mm. longo, lobis oblongo-linearibus obtusis 3 mm. longis; *labello* integro lineari-oblongo 4 mm. longo; *anthera* lineari ecristata, hirta inter loculos.

Sipora, 14739. Flowers carmine.

Phaeomeria imperialis *Lindl.* Sipora. Flower crimson with white edges to the petals.

Phaeomeria minor *Ridl.* n. sp.; species ab omnibus distincta in statura nana, foliis et floribus parvis et bracteis exterioribus ovatis acutis.

Herba nana; *foliis* angustis lanceolatis acuminatis cuspidatis 40 cm. longis, 4 cm. latis, basibus late rotundatis; *pedunculo* 16 cm. longo vaginis oblongis obtusis tecto; *capitulo* 2.4 cm. lato; *bracteis* externis ovatis acuminatis 4 cm. longis; *bracteolis* spathaceis pallidis dentibus 2 ad apices pilosis; *calyce* roseo tubuloso dentibus 3, apicibus pilosis; *corolla* lobis lineari-oblongis cucullatis obtusis roseis; *labello* brevi tenui lineari-oblongo; *anthera* crassa ecristata oblonga apice retuso; *stigmate* magno ovato-peltato; *stylo* hirto.

Siberut, 14560. Flowers carmine; the flowers in bud only; the lip appeared to be yellow.

The smallest species in the genus.

Plagiostachys sumatrensis *Ridl.* n. sp.; *P. laterali* Ridl. affinis differt foliis latioribus velutinis, labello oblongo retuso.

Herba, rhizomate lignoso; *caule* valido 1 cm. crasso; *foliis* lineari-oblongis cuspidatis basibus attenuatis superne glabris subtus velutinis 52 cm. longis, 8 cm. latis, petiolis hirtis 2 cm. longis, ligula brevi truncata; *spicis* 2 lateralibus in pedunculo velutino; *bracteis* 2 magnis coriaceis velutinis 3 cm. longis; *spica* majore 8 cm. longa, 2 cm. crassa, altera laterali inferiore 4 cm. longa; *floribus* flavis dense congestis, *bracteolis* in cupula tubuloso-infundibuliformi connatis florem circumambientibus, marginibus laciniatis papillosis viscosis; *calyce* 2 mm. longo infundibuliformi laciniato, lobis brevibus viscosis; *corollae* tubo calyce aequilongo, lobis oblongo-linearibus obtusis 4 mm. longo; *labello* unguiculato, limbo carnoso decurvo oblongo subquadrato retuso mucronulato, costis tribus; *stamine* corollam paullo superante, filamento filiformi, anthera oblonga, calcara 2 ad basin divergentia dorso pubescente; *stylodiis* oblongis obtusis carnosis; *capsula* rotundato-oblonga costata 4 mm. in diametro.

Siberut, 10584. Flowers yellow.

Alpinia nobilis *Ridl.* Sipora, 14672. Flowers white, lip yellow.

A. malaccensis *Roscoe.* Siberut, 14454. Flowers white and red.

Alpinia quadriloba *Ridl.* n. sp.; affinis *A. Fraserianae* Bak., sed panicula laxiore foliis multo majoribus, labelli subaequaliter 4 lobo, et anthera cristata differt.

Herba caulibus validis 1.5 m. ferme 1 cm. in diametro ad bases, vaginis lineari-oblongis tectis; *foliis* pluribus elliptico-lanceolatis cuspidatis ad bases attenuatis 24 cm. longis 5.5 cm. latis, marginibus spinulosis; petiolis 1 cm. longis, ligula oblonga rotundata 6 mm. longa; *panicula* 8–15 cm. longa, ramis 7 mm. longis; *bracteis* deciduis lanceolatis 4 mm. longis; *calyce* infundibuliformi 7 mm. longo, lobis 3 aequalibus rotundatis; *corollae* tubo paullo longiore lobis oblongis obtusis 3 mm. longis; *labello* breviore ungue lineari canaliculato, lobis 2 erectis oblongis obtusis, limbo quadrifido lobis oblongis obtusis; *stamine* longiore, anthera lineari curva, connectivo in dorso prominulo, *appendice* parvo integro oblongo obtuso terminata.

Siberut, 14527 (type); flowers white and pink. Sipora, 12724; flowers pinkish to white.

Marantaceae.

Donax grandis *Ridl.* Siberut, 14459; flowers white. Sipora, 14677; flowers white, centre pale yellow.

Stachyphrynium sumatranum *Schum.* Sipora, 14678, 14723. Flowers white, sepals crimson.

S. Jagoranum *Schum.* Siberut, 14544. Flowers white.

Phrynium hirtum *Ridl.* Siberut, 14513; flowers pink; fruit crimson. Sipora, 14807; leaves dull crimson.

This has also been collected in Sumatra by Beccari.

Musaceae.

Musa sumatrana *Becc.* Ill. Hort. xxvii. 37. t. 375.

This species has never been fully described, Beccari's description being only that of the foliage of a young plant, so I here give a description of it.

Herba, caulibus circiter 2 m.; *foliis* oblongis 30 cm. latis, juvenibus brunneo-maculatis, nervis horizontalibus 2 cm. distantibus, costa et petiolo crassissimis; *spica* circiter 1 m. longo deflexo rachide superne hirto 2 cm. crasso; *bracteis* oblongo-linearibus 10 cm. longis 4 cm. latis; *floribus* masculis; *calyce* lineari dentibus ovatis 3 parvis, 2 cm. longo; *corolla* lineari-cymbiformi dentibus 2 acutis, medio crasso marginibus tenuibus 4 cm. longa; *staminibus* filamentis linearibus 2 cm. longis; antheris linearibus aequilongis; *stylo* gracili 4 cm. longo; *baccis* 6 in uno serie, 6 cm. longis, 2 cm. crassis (in siccis), pedicellis hirtis 7 mm. longis.

Siberut, 14629.

AMARYLLIDACEAE

Cuculigo latifolia *Dryand.* Siberut, 14578, 10500.

BURMANNIACEAE.

Gymnosiphon aphyllum *Bl.* Siberut, 14596. Flowers white and violet.

COMMELINACEAE.

Pollia thyrsiflora *Endl.* Sipora, 14690.

Aneilema lineolatum *Kth.* Sipora, 14814. Flowers white, sepals and fruit crimson brown.

Forrestia marginata *Hassk.* Siberut, 14497. Fruits crimson.

Floscopa scandens *Lour.* Sipora, 15811. Flowers very pale violet.

FLAGELLARIACEAE.

Flagellaria indica *Linn.* Siberut, 14571. Sipora, 14572.

Susum malayanum *Hook. fil.* Siberut, 14576.

PALMACEAE.

Areca pumila *Bl.* Siberut, 11440.

Pinangia noxa *Bl.* Siberut, 11437.

I have seen no specimen of the Javanese plant, but this specimen fits Blume's figure in Rumphia.

Licuala spinosa *Thunb.* Siberut, 14614.

In this specimen some fruits have two or occasionally 3 carpels fully developed into drupes.

Calamus Diepenhorstii *Miq.* Siberut, 11446. Fruit pale rusty.

Daemonorops dracunculus *Ridl.* n. sp.; affinis *D. dracone* Bl. sed differt in foliolis remotis et spathis spinis griseis in seriebus dense armatis.

Palma scandens, *foliis* ultra 1 m. longis, rachide 1 cm. crasso inferne unguibus atro-acuminatis 4–6 congestis basibus latis armato foliolis dissitis alternis, infra 4.5 cm. remotis linearibus breviter acuminatis basibus angustatis, costa elevata, nervis circiter 8, setis brevibus atris remotis in marginibus et costa superne, longioribus et pluribus ad apices, 37 cm. longis, 4 cm. latis; flagello terminali valido 1.04 m.; *spadice* (fructibus juvenibus) 24 cm. longis; *pedunculo* 7 cm. longo spinis atro-griseis planis pugioniformibus in seriebus dense armato; *spatha inferiore* 15 cm. longa, 2.2 cm. lata, oblongo-lanceolata dense spinis atro-griseis 1 cm. longis planis pugioniformibus 5–7 in seriebus armata; *spatha secunda* coriacea 15 cm. longa, 4.5 cm. lata, serie spinarum in medio versus basin, costis transversis pluribus in parte superiore; *spatha terminali* ovata acuta inermi 4.5 cm. longa, 2 cm. lata; *spadice* condensata furfuracea, basi 3 cm. longa nuda, quadrangulata,

ramis 5 cm. longis; *spatheis* brevibus patelliformibus; *calycis* lobis brevibus 3 rotundatis; *petalis* lanceolatis acuminatis coriaceis striatis 2 mm. longis; *drupis* juvenibus ovoideis apicibus conoideis, squamis resiniferis rhomboideis latioribus quam longioribus; *stylis* brevibus cornutis recurvis.

Siberut, 10585.

PANDANACEAE.

Pandanus spinosissimus *Ridl.* n. sp.; species *P. stenophyllo* Kurz affinis, syncarpiis minoribus pluribus spicatis differt.

Frutex, foliis rigidis lineari-acuminatis laevibus, costa nulla, spinis pallidis erectis copiosis et densis ad apices, 1 m. longis, 2 cm. latis; *floribus* masculis ignotis; *inflorescentia feminea* 10 cm. longa in pedunculo, 7 cm. longo; *capitulis* globosis 5 sessilibus in rachide flexuoso, 2 cm. longis; *bracteis* lanceolatis acuminatis 10–12 cm. longis, 1 cm. latis ad bases, marginibus spinosis; *drupis* in flore 5 mm. longis, parte libero brevi lato rotundato; *stylo* lato corneo, basi lato oblongo; *stigmatibus* divaricantibus acutis; in *fructu* capitulis 3 cm. longo, 2 cm. lato; *drupis* 1 cm. longis, 5 mm. latis.

Siberut, 14086. Flowers green.

Freycenetia sumatrana *Hemsl.* Siberut, 14565.

Freycenetia Klossii *Ridl.* n. sp.; *F. angustissimae* Ridl. planta papuana affinis foliis multo latioribus et longioribus et rigidis, et *F. albanica* Merrill, Philippinarum drupis ejus autem 3 vel pluribus stigmatibus diversa.

Frutex scandens, *caule* 8 mm. in diametro; *foliis* rigidis linearibus acuminatis, costa prominente spinis pallidis erectis ad bases et apices, 22 cm. longis, 8 mm. latis, vaginis marginibus latis papyraceis pallide brunneis 2 mm. latis; *spicis masculis* bracteisque ignotis; *spadice feminea* 1 cm. longa, 4 mm. crassa tandem 2 cm. longa, 6 mm. lata, pedunculo 1 cm. longo costis scabridis 5; *drupis* conicis apicibus liberis angulatis; *stigmatibus* 1 vel 2 raro 3.

Siberut, 14547. Small Pandan.

AROIDEAE.

Alocasia longiloba *Miq.* Siberut, 11438. Flowers yellowish-white; spike buff, base white, stem mottled.

This is exactly the large form described by N. E. Brown as *Alocasia eminens*.

Homalomena lanceolata *Miq.* Sipora, 14777.

A form with few primary nerves. Some of the specimens, evidently from cracks in the rocks in streams, are only 7 cm. long, with leaves 2 cm. long.

H. cordata *Schott.* Siberut, 12297. Flowers whitish.

Homalomena multivenosa *Ridl.* n. sp.; species *H. batoensi* Engler affinis sed nervis foliorum 12-paribus approximatis.

Herba, rhizoma validulum; *foliis* elliptico-lanceolatis longe acuminatis basibus longe attenuatis, nervis subtus prominentibus,

gracilibus approximatis parallelis ascendentibus 12-paribus, costa basi applanata superne attenuata 15–17 cm. longis, 6 cm. latis, petiolis 13.5 cm. longis gracilibus 4 cm. vaginitis; *pedunculis* gracilibus 4 cm. longis; *spatha* oblonga, 2.2 cm. longa, 4 mm. crassa brevissime rostrata; *spadice* gracili ferme aequilonga, parte mascula 7 mm. parte feminea 1 cm. longa; *pistillis* ovoideo-globosis; *stylo* brevi projecto; *stigmate* rotundato; *floribus sterilibus* nullis. Siberut, 11441.

Aglaonema Schottianum *Miq.* Sipora, 14678.

Anadendrum montanum *Schott.* var. **ovalifolium** *Ridl.* n. var.; foliis basibus latis elliptico-ovatis, spathis per parvis 1 cm. longis. Sipora, 14694.

Raphidophora batoensis *Engl.* Siberut, 14470. Sipora, 14713. Flowers black on pale buff.

The spathe was not described by Engler; it is boat-shaped, 3 cm. long, coriaceous with a cusp 1.5 cm. long.

Scindapsus longipetiolata *Ridl.* n. sp.; species *S. perakensi* Hook. f. differt petiolis folio multo longioribus elongatis.

Epiphyta, *rhizomate* 7 mm. in diametro; *foliis* 5 cm. distantibus subfalcatis lanceolatis acuminatis basibus attenuatis obtusis costa prominente, nervis densissimis copiosis 27 cm. longis, 6 cm. latis, petiolis 12–15 cm. longis, alatis pro 12–15.5 cm. longitudinis; *spadice* cylindrico obtuso 6 cm. longo, 7 mm. crasso, *pedunculo* 7 cm. longo; *spatha* non visa; *ovariis* oblongis obscure quadrangulatis 2 mm. longis saepe processubus lateralibus 1 vel 2; *stigmate* lineari brevi.

Sipora, 14708. Flowers brownish-grey.

Cyperaceae.

Kyllinga monocephala *Rottb.* Siberut, 13091. Flowers white.

Cyperus pilosus *Vahl.* Siberut, 10573.

C. digitatus *Roxb.* Siberut, 13088.

Fimbristylis diphylla *Vahl.* Siberut, 10571. Flowers white.

F. miliacea *Vahl.* Siberut, 10572. Sipora, 14790.

Hypolytrum latifolium *Rich.* Siberut, 12285.

Mapania humilis *Naves & Villers.* Siberut, 11442. Sipora, 14815.

Scirpodendron costatum *Kurz.* Siberut, 14082. Sipora, 14783.

Gramineae.

Leptaspis urceolata *R. Br.* Sipora, 14712.

Ischaemum muticum *Linn.* Siberut, 14460. Flowers white, yellowish.

I. timorense *Kunth.* Siberut, 14486.

Imperata exaltata *Brngn.* Siberut, 13089.

Coelorrhachis glandulosa *Brngn.* Sipora, 14725.

Pollinia sumatrensis *Ridl.* n. sp.; species *P. montanae* Nees et *P. gratae* Hack. affinis differt glumis acuminatis.

Gramen, culmis ramosis ultra 60 cm. altis; *foliis* herbaceis lanceolatis acuminatis, basibus attenuatis glabris vel sparse hirtis, 12 cm. longis, 1 cm. latis, ligula brevi, pilis longis albis, vaginis albo-pilosis in margine apicali; *pedunculis* gracilibus 15 cm. longis vel ultra; *panicula* racemorum 3 ramosorum 7 cm. longorum, articulationibus angulatis marginibus pilis rigidis erectis 1 mm. longis; *spiculis* singulis, gluma I angusta lanceolata acuminata marginibus apicique hirtis carinata, gluma II ferme aequilonga lanceolata acuminata apice sparse hirta, aristata; gluma III angusta lanceolata tenuiore, gluma IV ad aristam capillari 2.2 cm. longam reducta, palea brevi oblonga; *caryopsi* lineari laevi brunnea.

Sipora, 14788. Flowers orange.

Setaria rubiginosa *Miq.* Siberut, 14483. Flowers dull green.

Echinochloa colona *Link.* Siberut, 14485. Sipora, 14789. Flowers deep crimson.

Paspalum auriculatum *Presl.* Siberut, 14626.

Sacciolepis interrupta *Stapf* :—*Panicum interruptum* Willd. Siberut, 14626.

Cyrtococcum accrescens *Stapf.* Siberut, 14482.

Phragmites communis *Linn.* Siberut, 14617.

Gnetaceae.

Gnetum oxycarpum *Ridl.* n. sp.; species affinis *G. campestri* Gamble sed major, drupis ellipsoideis acuminatis.

Frutex scandens, *caule* ultra 1 cm. crasso, ramis gracilibus articulatis; *foliis* coriaceis (siccis pallide brunneis) ellipticis acutis cuspidato-acuminatis basibus breviter cuneatis, nervis 7-paribus arcuantibus indistinctis, nervulis paucis, 6 cm. longis, 3 cm. latis (cuspide ultra 1 cm. longo), petiolis 4 mm. longis; *floribus* masculis ignotis; *spica feminea* fructescente in ligno vetusto 6 cm. longa in pedunculo lignoso 1 cm. longo, verticillis 6-florum, 2 mm. dissitis, *cupulis* marginibus valde undulatis, *ovariis* conicis acuminatis acutis, cupulis (perianthiis) vix profundis hirtis in marginibus, intus glabris; *drupis* ellipsoideis acuminatis sessilibus 3 cm. longis, 1 cm. latis.

Siberut, 14590. Creeper.

XI.—VASEY GRASS IN AFRICA. C. E. Hubbard.

Specimens of a useful fodder grass, " Vasey Grass " (*Paspalum Larranagai* Arech.), were recently received from Professor C. E. Moss, who collected them in Milner Park, Johannesburg, Transvaal. As the grass is not well known in South Africa, and as its correct

name has been much in doubt, the following brief account of the species may be of value.

Paspalum Larranagai Arech. is a native of South America, being found in the Argentine, Uruguay, Paraguay and Brazil. It was introduced, it is believed, into the United States about 1882, and is now wide-spread on the moist lands from South Carolina to Alabama and Texas and occurs also in California. It was probably introduced into South Africa under the name of *Paspalum dilatatum* Poir., or *P. virgatum* Linn.

This grass was first described by Vasey in 1886 as *P. virgatum* var. *pubiflorum* from North American specimens*. In 1899 Scribner raised it to specific rank giving it the name *P. Vaseyanum*† It had, however, been described five years previously by Arechavaleta as *P. Larranagai* from Uruguayan material‡. Though this is its correct name, it is obvious that it has been used as a fodder grass under the name of *P. virgatum* not only in North America, but apparently also in parts of South Africa.

With regard to South Africa, no specimens of the true *P. virgatum* Linn. from that country are to be found in the Kew Herbarium, and it appears probable that the grass referred to by Leppan and Bosman in "Field Crops in South Africa (1923)", p. 295, and by Mundy in Rhodesian Agricultural Journal, xix (1922), p. 142, as *P. virgatum* ("Upright Paspalum"), is in reality *Paspalum Larranagai*.

That the Rhodesian plant is *P. Larranagai* is fairly certain on account of the fact that a specimen cultivated at the Department of Agriculture's Experimental Station, Salisbury, in 1919 (Govt. Herb. no. 2601), and now at Kew proves to be that species, and the same is true with regard to specimens exhibited from Rhodesia at the British Empire Exhibition at Wembley.

The following particulars of the species have been compiled, as a correct description of this grass may not be readily accessible in South Africa.

Paspalum Larranagai Arech.—A tufted perennial grass. *Culms* erect, 0.9–1.8 m. or more high, stout, striate, glabrous. Lowest *leaf-sheaths* hispid with stiff ascending or spreading tubercular-based hairs or almost glabrous, upper glabrous or nearly so. *Ligules* membranous, up to 8 mm. long (in the African specimens). *Blades* linear-lanceolate, rounded at the base and tapering gradually to a fine point, up to 5 dm. long and 18 mm. wide, hirsute with long white hairs just above the ligule, otherwise glabrous. *Inflorescence* up to 40 cm. long, composed of 10–25 erect or slightly spreading *racemes*, lowest from 8–12 cm. long; rhachis slightly less than 1 mm. wide, generally hairy at the base, like the pedicels finely scabrid on the margins. *Spikelets* 4-seriate, paired, imbricate, ovate, 2–2.5 mm. long and about 1.4 mm. wide, acute, hairy. *Lower*

* Vasey in Bull. Torrey Club, 13.167 (1886).
† Scribner in U.S. Dept. Agric. Bull. Agrost. 17 : 32, fig. 328 (1899).
‡ Arechavaleta in Ann. Mus. Nac. Montevideo 1 : 60, with fig. (1894).

glume o. *Upper glume* the same shape and size as spikelet, membranous, convex, 3-nerved, pilose on the margins with long hairs, with shorter ones on the surface. *Lower valve* similar in size, shape, and hairiness to upper glume, 3-nerved. *Upper valve* widely ovate, glabrous, yellowish white.

In the United States this grass is known as "Vasey grass," and it seems probable that it will become of increasing agricultural value in North America. Piper (*) remarks:—"When abundant it is much cut for hay, the quality of the hay being considered excellent. It continues to grow all through the winter except in very cold weather and therefore affords late pasturage. It flourishes best on wet heavy land, but succeeds well on moist sandy land and also withstands very severe drought. In pastures continuous heavy manuring kills the grass.

"The seeds are light and 10–20 pounds per acre should give a satisfactory stand, this depending on the quality of the seed. These are produced in abundance, but as the grass continues to produce flowering culms during a long season, every stage from young flowers to ripe seeds is found on the plant. The best practice is to cut the first crop for hay and the second or last for seed. It has an advantage over *P. dilatatum* in rarely being attacked by Ergot."

The true *Paspalum dilatatum* Poir., to which this species is allied, and with which it has been confused, differs in having spikelets 3–3.5 mm. long and usually less than 8 racemes in the inflorescence. *Paspalum virgatum* Linn. differs from *P. Larranagai* in having glabrous or slightly pubescent spikelets.

XII.—STANDARD-SPECIES. T. A. Sprague.

It is generally agreed that certainty in the application of names is of paramount importance in nomenclature (Journ. Bot. 1924, 79). The use of the same generic name, by different botanists, for different natural groups possessing no common element, leads inevitably to confusion and waste of time. Whenever, as frequently happens, a genus is divided into two or more genera, the question at once arises as to which of these should continue to bear the original generic name. Obviously the generic name should not be transferred to a genus containing none of the original species. If the genus, when first effectively published, comprised only a single species, the generic name should naturally remain attached—whether as an accepted name or as a synonym—to the segregate genus including that species. If the genus originally included two or more species, however, difficulties may arise, inasmuch as different authors may retain the name for different elements of the original genus. The only way in which permanent

* U.S. Dept. of Agric. Farmers Bull. 1433: 22–26, fig. 21 (1925).

uniformity in the application of such generic names can be attained is by means of *agreement* in each case on a particular species, to which the generic name is permanently attached. This species will then serve as a fixed point or standard, which is permanently included within the generic limits, however narrowly or widely they may be drawn. Hence it may be termed the "standard-species," and the method of applying names with reference to such standards may be called the "standard-method."

Two different methods of applying generic names are widely adopted, namely, the "residue-method" and the "type-method." Under the residue-method the generic name is applied to the residue of the genus after subtraction of the successive segregates. It is unsatisfactory in many cases because: (1) it may lead to the generic name being retained by the least characteristic element of the original genus; (2) it may even lead to the generic name becoming applied to a genus containing none of the original species; (3) it may not permanently determine the application of the generic name, as the residue itself—if comprising more than a single species—may subsequently be subjected to still further segregation.

Under the type-method the generic name is applied so as to include the so-called "type-species," namely, the species which the original author of the genus had chiefly in mind when he established the genus. This method is frequently unsatisfactory because: (1) there is often no reason to suppose that the original author of a given genus regarded *any* species as a nucleus or as being more representative than the others; (2) opinions differ in many cases as to which is to be regarded as the type-species; (3) the adoption of the type-method leads in numerous cases to serious disturbance in generic nomenclature, unless *exceptions* are admitted.

It should be clear that neither the residue-method nor the type-method is wholly satisfactory. The standard-method combines the advantages of both, without their defects. It permanently fixes the application of generic names by the acceptance of "standard-species," but leaves the selection of the standard-species to be decided on its own merits in each genus, so as to avoid serious changes in nomenclature. It embodies the principle of the type-method, as accepted by the recent Imperial Botanical Conference (Proceedings, 306, 384; 1925), but provides for exceptions.

The preparation of a list of "standard-species" for *all* generic names would be an immense task, and its accomplishment would necessarily be a gradual process. As it is mainly in regard to the application of *Linnean* generic names, however, that differences of opinion arise, it would be sufficient, in the first place, to supply a list of standard-species of the Linnean genera. Such a list should be accompanied by reasons for the selection in each case, otherwise it would fail to command attention. An interval of at least one year after publication should elapse before the list is submitted to

an International Congress for consideration. This would afford adequate opportunities for discussion of disputed cases, if any. A list of suggested standard-species for the Linnean genera of Tetradynamia (*Cruciferae*, with the genus *Cleome*) has been published by Miss M. L. Green in *Kew Bull.* 1925, 49–58, as a sample of what is proposed. Standard-species should also be supplied for all the "nomina generica conservanda" and for any proposed new ones.

The following Rules are suggested as a guide to the selection of standard-species.

Rule 1.—The standard-species should be one which was included in the genus when the latter was first effectively published.—Examples 1–6.

Rule 2.—If there is clear evidence that the original author regarded a particular species as a nucleus or type of his genus, it is accepted as the standard-species.—Examples 1–3.

Rule 3.—If there is clear evidence that the original author regarded a particular subdivision of his genus as a nucleus or as typical, the standard-species is selected from that subdivision.—Example 4.

Rule 4.—If there is no such typical species or subdivision the standard-species is selected from among the original species in such a way as to conserve the generic name, if possible, in its generally current application.—Example 5.

Rule 5.—Nevertheless, if grave disturbance in nomenclature would be caused by adherence to the foregoing Rules, exceptions may be made. Each case should be considered on its own merits.—Examples 7 (exception to Rule 1), 6 (exception to Rule 2).

Example 1.—The genus *Gesneria* L. originally included only two species, *G. humilis* L. and *G. tomentosa* L. (Sp. Pl. 612). These were removed by Martius in 1829 to his new genera *Conradia* and *Rhytidophyllum* respectively. Nothing of the original genus *Gesneria* being left, Martius (Nov. Gen. iii. 27), misapplied the name (in the form *Gesnera*), to a third genus, which had been erroneously included in *Gesneria* L. This misapplication has now been rectified by general consent. As the generic name *Gesnera* was originally proposed by Plumier for the species subsequently named *G. humilis* by Linné, this is now accepted as the standard-species of *Gesneria* (*vide* Fritsch in Engl. & Prantl, Nat. Pflanzenf. iv, 3b, 183; Urb. Symb. Antill. ii. 377); and *Gesnera* Mart., non L., becomes *Rechsteineria* Regel (*vide* Fritsch in Engl. Jahrb. 1. 434).

Example 2.—The genus *Eranthemum* L. originally included only one species, *E. capense* L. (Sp. Pl. 9), which was based on a plant collected in Ceylon by Hermann, and described by Linné under the name *Eranthemum* in Fl. Zeylan. 6, n. 15 (1747), and Amoen. Acad. i. 384. In Sp. Pl. 9 Linné unfortunately confused this with a Cape plant, *Ephemerum Lychnidis flore Africanum* Herm. Parad. 153, and called the species *E. capense* in consequence. Hermann's

Ceylon plant is conspecific with *Justicia montana* Roxb. Cor. Pl. 41, t. 176, which is the type-species of *Daedalacanthus* T. Anders. Hence the latter genus is now known as *Eranthemum* L., and the genus which has generally but erroneously passed under the name *Eranthemum* is called *Pseuderanthemum* Radlk. (*vide* Engl. & Prantl, Nat. Pflanzenf. iv. 3b, 311, 330; Stapf in Bot. Mag. t. 8239; Gamble, Fl. Madras, 1023, 1064).

Example 3.—The genus *Vella* was based by Linné (Hort. Cliff. 329), on *Nasturtium silvestre valentinum* Clus. In 1753 he named this *Vella annua*, and added a second species, *V. Pseudocytisus* (Sp. Pl. 641). A. P. De Candolle separated *V. annua* in 1821 as the type of a new genus *Carrichtera*, retaining the name *Vella* for *V. Pseudocytisus*. But as *V. annua* was the nucleus of *Vella* L., it should retain that generic name, and the genus of which *V. Pseudocytisus* is representative becomes *Pseudocytisus* Kuntze (*vide* M. L. Green in *Kew Bull.* 1925, 51).

Example 4.—The genus *Nymphaea* L. (Sp. Pl. 510; Gen. Pl. ed. 5, 227) included the white water-lilies, the yellow water-lilies and the nelumbo, which are now regarded as belonging to three distinct genera. Adanson separated *Nelumbo* generically in 1763, and Salisbury in 1805 segregated the white water-lilies as *Castalia*, retaining the name *Nymphaea* for the yellow water-lilies. But as Conard (Rhodora, 1916, xviii. 161–164) has pointed out, Linné's generic description of *Nymphaea* was evidently drawn up primarily from the white water-lilies, as witness the phrase "petala germinis lateri insidentia." The standard-species of *Nymphaea* should accordingly be selected from the white water-lilies, of which there were two in Sp. Pl. ed. 1, namely *N. alba* and *N. Lotus*. The former is obviously indicated, as it was much better known to Linné.

Example 5.—The genus *Trifolium* L. (1753) included forty species. Linné divided it into five sections characterised as follows: "Meliloti leguminibus nudis polyspermis" (spp. 1–8); "Lotoidea leguminibus tectis polyspermis" (spp. 9–14); "Lagopoda calycibus villosis" (spp. 15–31); "Vesicaria calycibus inflatis ventricosis" (spp. 32–35); and "Lupulina vexillis corollae inflexis" (spp. 36–40). According to Britton (Britton and Brown, Ill. Fl. ed. 2, ii. 353), *T. pratense* is the type-species, but there seems to be no reason to suppose that Linné regarded any one of the species as more typical than the rest. *T. pratense* is, however, a suitable standard-species, as it is very well known, belongs to Linné's largest section, and is still retained in the genus.

Example 6.—The type-species of *Erysimum* [Tourn. ex] Linn. is undoubtedly *E. officinale*, which is the only species common to *Erysimum* Tourn. and *Erysimum* Linn. As the acceptance of *E. officinale* as the standard-species would involve the transference of the name *Erysimum* to the genus commonly known as *Sisymbrium*, it is suggested that *E. cheiranthoides* (one of the original species in Sp. Pl. ed. 1), should be substituted for *E. officinale* as

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the standard-species of *Erysimum* (*vide* M. L. Green in *Kew Bull.* 1925, 55).

Example 7.—The genus *Ixia* L. (Sp. Pl. 36) originally included only two species, *I. africana*, which is the type-species of *Aristea* Ait. (1789), and *I. chinensis*, which is assigned to *Belamcanda* Adans. (1763), emend., a "nomen conservandum" under the International Rules of Nomenclature. As the name *Ixia* was originally based by Linné (Cor. Gen. 1; *vide* Richter, Codex, 51), on *I. africana*, the name *Ixia* would in the normal course of events be retained for that species, thus replacing *Aristea*, and the horticulturally important genus commonly known as *Ixia* would have to be re-named (*vide* Hitchcock in Amer. Journ. Bot. 1923, x. 512). In order to retain the generic names *Aristea* and *Ixia* in their present application, it is suggested that *I. polystachya* L. Sp. Pl. ed. 2, 51 should be adopted as the standard-species of *Ixia*.

XIII.—ON THE FLORA OF THE NEARER EAST.

W. B. Turrill.

Pinus brutia *Ten.* Flor. Nap. i. lxxii. (1811) and v. t. 200 (1835/6).

It is generally acknowledged that Tenore figured and described a somewhat abnormal specimen with numerous cones. Allowing this to be an individual character, the following characters have been used for distinguishing two species as *P. halepensis* and *P. brutia*.

P. halepensis.	*P. brutia.*
Twigs long and thin, 2–3 mm. in diameter. clear gray.	Twigs thicker, 4–5 mm., yellowish-red.
Winter buds oval, 5 mm. long.	Winter buds oblong, 1–2 cm. long.
Leaves up to 9 cm. long, clear green, often gray-green.	Leaves 12–23 cm. long, darker green.
Young cones 1–2, rarely 3, on a peduncle of equal or greater length.	Young cones 3–4 (up to 6), longer than their peduncle.
Mature cones on a curved peduncle up to 2 cm. long, pendulous.	Mature cones nearly sessile, horizontal or ascending.
Apophysis up to 15 mm. broad with a clear transverse keel.	Apophysis up to 2 cm. broad with an inconspicuous transverse keel but with radiating lines or furrows.
Umbo clearly raised, medium or small.	Umbo flat and often not set at all above the apophysis-surface, larger.

I find that the above combinations of characters are not constant. To take some actual specimens preserved at Kew and the Natural History Museum:

1. *Huter, Porta, Rigo* ex itin. hispan. 1879, no. 889, from Sierra Cabo de Gata, Granada. Shoots rather short, gray, in the leaf-bearing parts 2 mm. in diameter, leaves 4.5–5.5 cm. long, mature cone pendulous, with a curved peduncle, apophyses (of

central scales) 15 mm. broad, transverse keel represented by a scarcely raised line. Umbo flat, 5 mm. broad.

2. *E. Bourgeau* Pl. d'Espagne 1850, no. 884, from "Forêt à Riopar". Yellowish-gray shoots, in the leaf-bearing parts varying from 2 to 6 mm. in diameter, leaves 3 to 9 cm. in length in different parts of the specimen, mature cone pendulous, with a curved peduncle, apophyses (of central scales) 11 mm. broad, transverse keel represented by a well raised line. Umbo clearly raised, 4-4.5 mm. broad.

3. *Heldreich* Herb. Graecum Normale no. 1300, from Attica, foot of Mt. Pentelicon. Branches gray, slender, in the leaf-bearing parts 1–3 mm. in diameter, leaves 5.5–8.5 cm. long, mature cone with apophyses of central scales 12–13 mm. broad, transverse keel scarcely apparent. Umbo nearly flat, 5 mm. broad with well developed radiations.

4. *Kett* from Gallipoli Peninsula. Branches yellowish-red at first soon turning gray, leaf-bearing portions from 1 cm. to 2 mm. in diameter, leaves clear gray-green, from 7 to 13.5 cm. long, mature cone slightly ascending to the branch bearing it, apophyses of central scales 15 mm. broad, transverse keel scarcely apparent. Umbo nearly flat, 4 to 6 mm. broad with well developed radiations.

5. *Turrill* 1059, Aug. 1925, specimen from Mt. Sergi, near Dubrovnik (Ragusa), Dalmatia. Leaves slender, 11 to 14 cm. long, scarcely 1 mm. in diameter, pale green in colour. Young branches reddish, turning gray later. Nearly mature cone almost at right angles to the branch bearing it, with peduncle 0.5 cm. long. Apophyses of central scales 1.8–1.9 cm. broad, transverse keel very weakly developed. Umbo flat with moderately developed radiations.

6. *Turrill* 1023, Aug. 1925, specimen from the Lapad Peninsula, near Gruž (Gravosa), Dalmatia. Leaves slender, pale green, 6 to 8.5 cm. long, scarcely 1 mm. in diameter. Young branches reddish, becoming gray later. Very young cones with peduncles 2.2 cm. long, sharply pendulous. As the cones pass to maturity the umbos become gradually flatter, but in some of the young stages they are bulging and very pronounced. The position taken by the cone varies with its age, size and position on the branch and the position of the branch itself. I have seen cones at all angles on one and the same tree.

7. Tenore's specimen of *Pinus brutia* at British Museum (Nat. Hist.). Leaves about 13 cm. long, moderately stiff, moderately dark in colour. Young detached cone, ovoid, nearly sessile, middle scales 1.2 cm. broad, 1 cm. long, flat umbo.

8. Miller's type of *Pinus halepensis* at the British Museum (Nat. Hist.). Leaves 5.5 cm. long, dark. Cones ellipsoid, middle scales 1.2 cm. broad, 8 mm. long, umbo small, 2–4 mm. broad, 2 mm. long, ridge of apophysis moderately developed.

It is obvious that many specimens show mixtures of the supposed specific characters. The recorded distributions of the two supposed species overlap, so that no geographical isolation can be assumed, nor does it appear that there is any natural ecological separation. It may be noted, however, that according to forestry authorities, trees with longer darker foliage, referred to *P. brutia*, do better on the Karst, for purposes of reforestation, than trees of *P. halepensis* with shorter paler foliage. After a careful examination of all available material and the examination in the field of hundreds of wild trees I am forced to the conclusion that *P. brutia* represents only a certain combination of characters, some of which depend on age, others on ecological conditions and some, perhaps, on genetical factors, that these characters are found in different combinations in other individuals, and that all such individuals together with those referable to *P. brutia* are to be included in the one species, *P. halepensis*.

Fagus orientalis *Lipsky*. Fl. Cauc. impr. Colch. novitates in Acta Hort. Petrop. xiv, 300 (1897).

This species is distinguished from the common European *F. silvatica* by the greater number of nerves (usually 9 to 12 each side of the midrib) in the leaves, the perianths of the male flowers broadly and shortly campanulate, with shorter lobes, the laciniae of the fruit involucre dissimilar, larger, and some frequently green and even foliaceous. Palibine has since segregated from *F. orientalis* specimens which he considers to represent a new species —*F. Hohenackerana* Palib. in Bull. Herb. Boiss. Ser. II. viii. 378 (1908), from the Eastern Caucasus and Persia. The material available at Kew is insufficient for me to test the value of this segregation.

The distribution of *F. orientalis* towards the east is thus doubtful but it is interesting to note that it stretches a very considerable distance around the Black Sea. From the Caucasus it stretches right across northern Asia Minor to Mt. Olympus in Bithynia and Mt. Ida in the Troad. It probably has a wide extension in the interior for I have seen specimens from Phrygia and the Amanus range. It has been recorded from eastern Bulgaria and from the Crimea [E. Wulff and T. Zyrina in Oesterr. Bot. Zeitschr. lxxiii. 276 (1924)]. Its distribution in the former country is of considerable interest, as it appears to be limited to the eastern side and to the lower and hill altitudinal zones. This contrasts with the wide distribution of *F. silvatica* in Bulgaria, and with its limitation to the montane and high mountain altitudinal zones. N. Stojanoff and B. Stefanoff recorded *F. orientalis* from shady ravines in the Kamčia in E. Bulgaria (Oesterr. Bot. Zeitschr. lxxii. 85, 1923), and a map of its distribution in the Strandja district is given by Stefanoff in a later publication (XX. Godišnike na Sof. Univ. 1924). It is therefore of interest to record its distribution still farther north on the western coast of the Black Sea. Last year I received from

Mr. B. Gilliat-Smith, then British Vice-Consul at Varna, specimens of a beech. In a letter to me he says: "Yesterday I went an excursion to Aladja Monastery, north-east of Varna, along the coast. In the forest south of the monastery I found a beech bush growing, and I'm sending you some samples in the next batch. This is the first wild beech I've ever seen growing round Varna. I enquired of the monk who lives at the monastery, an intelligent man whom I've known for the last 15 years, by the name of Dedo Todor, *i.e.*, Father Todor (Theodorus). He told me that where we were, on the southern slopes of the hills, facing the sea, there was very little beech, but to the north, about a quarter-of-an-hour's walk from the Monastery, at a place facing north, and known as 'Yaltalar,' there is a whole forest exclusively of beech."

The specimens sent by Gilliat-Smith proved to be typical *F. orientalis*, and it is now desirable to obtain specimens of the beech recorded from the Dobruja. This has always been called *F. silvatica*, but since it is a plant of low altitudes it may well be *F. orientalis*.

Verbascum phoeniceum *L.* var. **flavidum** *Boiss.* Fl. Or. iv. 346 (1879).

The specimens quoted by Boissier are: Macedonia (Friv.), Erzerum (Calv.), Armenia ad Ortus (Huet). Of these I have only seen a scrap of the last preserved in Herb. Kew. Boissier founds his variety solely on the colour of the corolla "lutea aut lutescenti-virens." In the Oester. Bot. Zeitschr. xli. 57 (1891) Freyn and Bornmüller raise the var. *flavidum* to specific rank and give a short description in German, based, probably on the specimen quoted by them from E. Anatolia: in apricis montis Kara-Dagh ad septentrionem urbis Amasia, alt. 600–800 m.s.m. ubi die 30 majo 1889 leg. Bornmüller (Exsicc. Nr. 592). Their *V. flavidum* is contrasted with *V. phoeniceum* and *V. xanthophoeniceum*: the stem is leafy and not shaft-like, with the leaves decreasing in size upwards, the basal leaves are shortly stalked (not sessile), the wool of the filaments is purple (not violet), the calyx 3.5 mm. (not 2 mm.) long, the bracts long-oval, long-acuminate, the capsule is double as long as the calyx, the leaves are papillose on the underside and the flowers dull-yellow. I am not certain that the plants placed by Boissier under his variety *flavidum* are to be placed in the same variety or species as Bornmüller's plant, but I now refer the plants mentioned under *V. Blattaria* in Kew Bull. 1922, 296, to *V. phoeniceum* var. *flavidum* Boiss. Velenovsky in Flora Bulgarica 416 (1891), describes a new variety of *V. phoeniceum* as var. *amplexicaule*. This is a tall closely leafy luxuriant plant, with the lower leaves deeply cordate or cordate-auricled, the cauline leaves passing gradually into the bracts, the pedicels acutely spreading, the lower equalling the bracts, the upper double their length. In the Suppl. 210 (1898) he adds that the flowers are violet and the plant is essentially one of montane localities.

Mr. Gilliat-Smith collected seeds of a *Verbascum* near Varna in Eastern Bulgaria. About a dozen plants grown from these have flowered this year (1925) in the Experimental Ground attached to the Herbarium at Kew. These plants are very uniform and are obviously different from typical *V. phoeniceum* in their luxuriant growth, much branched densely leafy stems and yellow flowers, although the structure of the anthers is intermediate between that found in typical *V. phoeniceum* and typical *V. Blattaria*. Since the habit and the majority of characters agree with those of the latter species I describe it as a variety of this. A full description drawn up from living specimens is given below. The essential difference between *V. Blattaria* and *V. phoeniceum* is supposed to be that the former has three reniform and two adnate-decurrent anthers, and the latter all the anthers subequal and reniform. Other associated differences are the more luxuriant habit, leafy stems, amplexicaul cauline leaves, broader more foliaceous bracts, and larger calyces of *V. Blattaria*, contrasting with the more meagre vegetative development, nearly leafless stems or at most stems with a few not amplexicaul leaves, linear bracts, and smaller calyces of *V. phoeniceum*. All of these characters show a certain range of variation and the colour of the corolla is certainly not of specific value. Regarding the differences in the anthers, I have examined living and dried material showing intermediate conditions, such as are also found in my var. *grandiflorum* of the species *V. Blattaria*, published in the Botanical Magazine t. 8863, where, however, the anthers are not accurately shown. The degree to which the two anthers of the longer stamens are adnate-decurrent varies very considerably. Sometimes the adnation is complete for the whole length of the anther, often the anther is almost reniform, but shows a slight tendency to become adnate-decurrent on one side.

Verbascum Blattaria *L.* var. **luxurians** *Turrill*. Plants up to 1.74 m. in height. The stems stiffly erect, and much branched all the way up from the base to the inflorescence. The greatest diameter of the stem at the base is 14 mm. Running longitudinally down the stem are 5 obtuse-angled ridges. In the early rosette stage the leaves are dark green, oblong-spathulate or broadly oblanceolate in outline and narrowing to a short petiole about 5 mm. long. The first leaves are only slightly crenate at the margins, the later ones more so. The rosette is about 15 cm. in diameter. In the mature plant the erect flowering stem is densely covered with foliage leaves, which diminish in size upwards. The lower leaves are oblong, the middle ones oblong-lanceolate to broadly lanceolate, the upper ones ovate-lanceolate. They pass very gradually into the bracts—indeed, the uppermost leaves are of the same size, shape and structure as the lowest bracts. The lowest leaves are narrowed to the base and are practically sessile, while the rest have a markedly cordate base which clasps the stem

(amplexicaul). The upper surfaces of all the leaves are dark green and very glossy, the lower surfaces paler green and less glossy. The leaves stand out nearly at right angles to the stem, bending down a little at the ends. The inflorescence being simply racemose is of indefinite growth, and increases considerably in length as flowering proceeds, till it exceeds twice the length of the purely vegetative part of the stem. The pedicels lengthen from about 1.5 cm. to 2.3 cm. as the fruit matures, and become stouter. The calyx also increases in size with age, and the segments are erect when the corolla has just fallen but spread at right angles to the pedicels when the fruit is nearly mature. The segments are lanceolate, acute at the apex, the adaxial 9 by 2 mm., the abaxial 7 by 2 mm., and the lateral 8 by 2 mm. in the flowering condition. The sizes increase up to 1.2, 1 and 1.1 cm., respectively, in the fruiting stage. The corollas are a clear yellow in colour and 3 to 3.2 cm. in diameter, they are quickly caducous. The lobes are rounded and spread out nearly flat. The filaments are unequal, 5 to 9 mm. long and covered with purple hairs. Three anthers are distinctly reniform, the other two show some variation from flower to flower but are generally partially adnate on one side. The young ovary is almost globose, nearly 2 mm. in diameter and covered with glands; the style is 7 mm. long, with a few shortly stalked glands near the base and glabrous above. The fruit is nearly globose, 6 mm. in diameter, with numerous, distinct, sessile or nearly sessile glands.

Rumex acetosella *L.* It is well-known that within this species there are included plants of very different habits and leaf-shapes. Many of these are undoubtedly plants which are merely habitat forms, but there is one condition which is so frequent in South-East Europe and the Orient and which is so very striking when developed in an extreme manner that it calls for more attention, and the following facts indicate that it might form interesting genetical material. The plants referred to are generally named by systematists *R. multifidus* L. Sp.Pl. ed. 2, 482 (1762), pro parte, or *R. acetoselloides* Bal. Bull. Soc. Bot. France i. 282 (1854), or *R. acetosella* var. *multifida* DC. in Lamk. et DC. Fl. Fr. iii. 378 (1815). They are distinguished from the usual North European forms of *R. acetosella* by having the lateral lobes or segments of the leaf divided (or branched). The mode of division is not always the same and in a large mixed collection of specimens (such as those present in the Kew Herbarium) a graduated series from entire to much and deeply divided or branched lateral lobes can be arranged. Often leaves on the same specimen or on plants from or near the same locality show a wide range in this respect. Thus from the Gallipoli Peninsula, Thrace, the specimen *Durham* 20, Kilia, has narrow terminal and lateral segments in the upper leaves, broader ones in the lower leaves, but all quite entire; on the other hand, *Ingoldby* 322, near Gaba Tepe, has large leaves with long narrow

segments, the lateral ones each divided nearly to the base into 2 to 4 lobes. In spite of this the fact remains that most of the specimens from all parts of the Balkan Peninsula which I have seen and many of those from Asia Minor are what I term the var. *multifidus*, while all specimens from northern Europe are either var. *vulgaris* Koch or var. *tenuifolius* Wallr. sensu Asch. u. Graebn. Syn. iv. 786 (1912). The geographical separation of the three varieties is not by any means complete, but on the whole the var. *multifidus* is a Balkan Peninsula-Asia Minor type which extends westward at least to Italy and Sicily.

According to a note by A. Beguinot, Flora Ital. Exsiccata 1445, the var. *multifidus* remains true to its characters under cultivation.

Jasione Heldreichii *Boiss. et Orph.* Diagn. II. vi. 120 (1859) is very closely related morphologically to *J. montana*. The principal characters distinguishing it are the narrower bracts, which have more prominent lateral teeth, and together with the apex are often aristate or at least more acuminate than in *J. montana*, and the longer sepals. The geographical areas occupied by *J. montana* and *J. Heldreichii* are quite distinct so far as I have ascertained definitely. I have seen no specimens of the former from the Balkan Peninsula, and of the records of it, most if not all, refer to *J. Heldreichii*. All the Balkan Peninsular specimens at Kew of plants of *Jasione* of this group are *J. Heldreichii* and this species is also represented by typical specimens from the Bithynian Olympus. A single sheet from Mt. Tmolus (*Balansa* 332) is also probably this, but the material available is insufficient for me to be quite certain. *Jasione glabra* Vel. Oesterr. Bot. Zeitschr. xxxiv. 424 (1884) and l.c. xxxvi. 264 (1886), was afterwards [Fl. Bulg. 374 (1891)] reduced by the author to a variety (var. *microcephala*) of *J. Heldreichii*. The latter view is shown to be correct by a series of specimens from the Varna district recently received from Mr. B. Gilliat-Smith, and this year I have had many plants in flower in the Experimental Ground of the Kew Herbarium. All the characters mentioned by Velenovsky are found in varying degrees and in different combinations in a sufficient range of specimens. In the same row of living plants, individuals with and without basal rosettes occur, and it should be noted that these plants were raised from seed and flowered in the one year. The plants are decidedly greener (when alive) and more glabrous than those of this species I have seen growing wild in other parts of the Balkan Peninsula, and for this reason I retain, for the present, the varietal name.

Jasione montana has a wide distribution through northern, central and south-western Europe but in south-eastern Europe it is replaced by *J. Heldreichii*.

XIV.—MISCELLANEOUS NOTES.

Mr. F. S. WARD, B.S.A., has been appointed by the Secretary of State for the Colonies, Assistant Mycologist, Agricultural Department, Federated Malay States.

Miss I. C. VERDOORN, of the Division of Botany, Department of Agriculture, Pretoria, has been appointed, by the Government of the Union of South Africa, Assistant for South Africa in the Herbarium at Kew.

We note with pleasure, in the recent New Year's Honours List, the following appointment :—C.M.G., Mr. S. SIMPSON, Director of Agriculture, Uganda. Also the following promotions in, and appointments to, the Order of the British Empire, on the occasion of the ending of the British Empire Exhibition :—C.B.E., Mr. A. HOLM, Director of Agriculture, Kenya; O.B.E., Mr. A. H. KIRBY, Director of Agriculture, Tanganyika Territory, and Mr. E. J. WORTLEY, M.B.E., Director of Agriculture, Nyasaland Protectorate; M.B.E., Mr. T. D. MAITLAND, Botanist, Agricultural Department, Uganda, and Mr. W. H. PATTERSON, Entomologist, Agricultural Department, Gold Coast.

JOSEPH HENRY MAIDEN.—The death of Mr. J. H. Maiden, which was recorded in the last number of the Bulletin, took place at Turramurra, near Sydney, on November 16, 1925. Though he had not reached his 67th birthday he had long been regarded as the *doyen* of Australian botanists. For upwards of forty-two years he had been in frequent correspondence with Kew and had always shown himself its loyal and helpful friend.

Mr. Maiden was born at St. John's Wood, London, on April 25th, 1859. His early education was obtained at the City of London Middle Class School, from which he went to the University of London. He was awarded the Fishmongers' Scholarship tenable at the University of Cambridge, but he did not avail himself of this as he preferred to remain in London to continue his studies in the Science School of the London University. He attended Prof. R. Bentley's and Prof. D. Oliver's lectures on botany and thus early in life became associated with a member of the Kew staff, for Prof. Oliver at that time was Keeper of the Herbarium and Library. The delicate state of his health necessitated a suspension of his studies, and he was recommended to take a sea-voyage. Australia was chosen as the destination of the voyage, and in 1880 he arrived there, intending after a while to return to England, and had therefore furnished himself with a return ticket. The return portion of this ticket was never used by Mr. Maiden, for he was so favourably impressed with the country on landing at Sydney, and found that the climate suited him so well, that he decided to make his home in Australia. He does not appear to

have returned to England till twenty years later—in 1900—but in those twenty years he had made for himself a great name among the systematic and economic botanists of the world, and had given to the Sydney Botanic Gardens a position of the greatest importance among the botanical establishments in Australia.

During his early days in Sydney Mr. Maiden was employed in giving popular science lectures for the newly established Board of Technical Education. His lectures were so favourably received that in 1881 he was appointed first Curator of the Technological Museum, Sydney. Shortly after—in August, 1882—he began his correspondence with Kew, and this was continued up to the last few months of his extraordinarily busy life. In 1890 Mr. Maiden wrote "the Museum is up to its neck in debt to Kew." His letters contain many similar expressions, while his offers of material and information and help of various kinds were frequently repeated and accepted, much to the advantage of all the departments at Kew. It was doubtless owing to the valuable experience he gained while in charge of the Technological Museum that Mr. Maiden devoted so much attention to the economic botany of Australia even after he ceased to be Curator, and that so many of his publications relate to plants of industrial importance.

In 1896, Mr. Charles Moore, who had held the offices of Director of the Botanic Gardens, Sydney, and Government Botanist of New South Wales since 1848, retired, and Mr. Maiden was appointed his successor. His official duties ultimately comprised the charge of the Botanic Gardens, Government Domains, Garden Palace Grounds, and Campbelltown State Nursery, as well as those of Government Botanist of the State. He was also Officer-in-Charge of the Centennial Park, Sydney, which, including Queen's Park, consists of 823 acres. He nevertheless found time to travel over much of Australia in search of material and information for the various departments in his charge and the publications he prepared. Much of this travelling was done at his own expense. A trip of three months to Western Australia cost him £400. He was one of the most productive of botanical authors, and in several capacities assisted the scientific societies of New South Wales and the Australasian Association for the Advancement of Science. But Mr. Maiden found great pleasure in work of many kinds, and there seemed to be no limit to his activities. "I have been as busy as a bee," he wrote a little more than a year ago, and so apparently could he have written of his whole life. He was unmistakably a man of great energy, full of enthusiasm, reasonably proud of his knowledge and achievements, and strongly influenced by the desire to leave the world, and especially the botanical world of Australia, better for his being in it. Social duties were not ignored, and for many years he was engaged as a worker in the Cathedral Parish of St. Andrew's, Sydney, of which he was a churchwarden.

In 1901, Mr. Maiden had the satisfaction of seeing the completion

of the new buildings in the Botanic Gardens, including the Botanical Museum, said to be the first strictly botanical museum established in Australia, and the National Herbarium.

The centenary of the Sydney Botanic Gardens was celebrated in July, 1916, and during that year, as some recognition and appreciation of his many and valuable services to his adopted country and of his scientific work, Mr. Maiden was appointed to the Imperial Service Order. In the same year he was elected a Fellow of the Royal Society. In 1915 he was awarded the Gold Medal of the Linnean Society of London, to which he was elected as a Fellow in 1888. This was the first occasion on which the medal had gone to one of the great Dominions. Among other honours he received were the Mueller Medal from the Australasian Association for the Advancement of Science, in 1922, and the Clarke Memorial Medal from the Royal Society of New South Wales, in 1924. In the latter year, having reached the age-limit, he retired, and took up his residence at Turramurra, near Sydney, and, released from his many official duties, it was his intention to devote his time to the completion of his great work on *Eucalyptus*, while keeping himself in close touch with other botanical interests. We cannot but regret that retirement for him has been so brief and that far too soon his life of usefulness is ended.

Apart from his contributions to journals and to the publications of the various scientific societies in Australia, which cannot be far short of 300, including several written in collaboration with others, Mr. Maiden produced numerous independent works which are likely to have a permanent value. His first book was "The useful native plants of Australia (including Tasmania)," published in 1889. "Wattles and wattle-barks" has appeared in three editions, 1890, 1891 and 1906. "A bibliography of Australian economic botany" was published in 1892, and "A manual of the grasses of New South Wales" in 1898. "The forest flora of New South Wales" (1902–24) consists of eight quarto volumes containing 295 plates, with text. His greatest published work, "A critical revision of the genus *Eucalyptus*," the first part of which was issued in 1903, is now in its 64th part, which was received at Kew in July, 1925. Writing to Kew in October, 1924, Mr. Maiden said he wanted to finish the work in about seventy parts, and would then submit a key to the species, which he estimated to be about 350. Apparently nearly the whole of the remainder of the manuscript of the Revision was ready for the printer more than a year ago.

"A census of New South Wales plants," by Mr. Maiden and Mr. E. Betche, was published in 1916, and "Some of the principal commercial trees of New South Wales" in 1917.

Mr. Maiden published several papers on Australian explorers and botanists and others who in some way assisted the progress of botany in the continent, and he devoted a volume to "Sir Joseph Banks: the 'Father of Australia'," which was issued in 1909.

It is hoped that an autobiography which Mr. Maiden contem-

plated was so far completed at the time of his death that its publication will be possible.

A portrait of Mr. Maiden, reproduced from a photograph taken in August, 1924, was published in the *Gardeners' Chronicle* of December 13th, 1924, p. 400.

Botanical Magazine.—Part II of Vol. cli (1925) has now been issued and contains the following illustrations:—*Clerodendron Colebrookianum* Walp. (t. 9082), from India; *Rhododendron anthosphaerum* Diels (t. 9083), a native of North-West Yunnan; *Roscoea cautleoides* Gagnep. (t. 9084), also a native of North-West Yunnan; *Buddlea alternifolia* Max. (t. 9085), from South-eastern Kansu, China; *Catasetum tenebrosum* Kranzl. (t. 9086), a native of Peru; *Malvastrum hypomadarum* Sprague (t. 9087), a plant only known in cultivation and possibly of hybrid origin; *Aconitum anglicum* Stapf (t. 9088), a new species, found in the South West and West of England and in East Wales; *Berberis Vernae* C. Schneider (t. 9089), from West Kansu and North Szechuan; *Itea ilicifolia* Oliv. (t. 9090), from Central China; *Papaver commutatum* Fisch. & Meyer (t. 9091), a native of the Caucasus and the Orient, and *Geranium Farreri* Stapf (t. 9092), a new species collected by the late Reginald Farrer at Min-shan, on the border of Kansu and Szechuan.

The Forest Trust, British Honduras.—The Report of the Forest Trust, 1925, states that the appointment of Overseer of the Botanic Station was terminated and that the supervision of the Station has been placed under the Assistant Conservator of Forests, Northern Districts. This Station, originally established in 1892 in the grounds of Government House, but subsequently moved to Stann Creek district, owed its origin to the efforts of the Governor, Sir Alfred Moloney, K.C.M.G., whose object it was to provide "a distributing centre of economic plants of marketable value, where the wants of small and extensive cultivators could be met" (*K.B.* 1896, 103).

The situation of the station, some eight miles from Belize, has not been advantageous, however, in bringing the experimental botanic work of both forest and agricultural interest to the public eye, as the only convenient means of approach has been by river, and consequently visitors to the gardens have not been so many as would no doubt have been the case had the site been more accessible.

In 1922, with the appointment of Mr. Hummel as Conservator of Forests, the administration of the Station was taken over by the Forestry Department, and it has since served mainly as a forest experimental station. It is now controlled directly by the Forest Trust, and although the ornamental part of this station has been maintained and improved, an effort has been made to give more prominence to the Forest Section in which the chief experiments

are being carried out. The educational value of this work is amply demonstrated.

The Forest Trust, which now controls the Station, is unique among the forestry administrations in the British Empire. Mr. Hummel in his Report on the Forests of British Honduras, 1922, pointed out that the greater part of the revenue derived from forest industry was not credited as direct forest revenue, and he accordingly devised a scheme by which an increasing proportion of such revenue, eventually reaching a maximum of 60 per cent., should be allocated for the use of the forest service. This scheme with subsequent modifications is now in force. A percentage of the actual forest revenue under predetermined subheads, together with any surplus revenue over the total of $60,000, is directly credited to the Forest Service. Until the maximum contribution under this Scheme has been reached any further requirements of this Service are met from a Forest Loan of $250,000 specifically raised for this purpose. The administration of these funds and the approval of the general forest policy of the country are under the direction of the Forest Trust, composed of the Governor as Chairman and two official and two unofficial members appointed by the Governor.

This particular manner of providing for the forest service of the country has been specially designed for British Honduras, whose main source of revenue, directly and indirectly, is obtained from the natural forests. The exploitation of the natural forest resources has for a long period been going on unchecked and until recently no replacement has been attempted.

Sibthorp in the Gallipoli Peninsula. In *Kew Bulletin*, 1924, p. 287, an attempt was made to summarize the botanical collecting that had been done in the Gallipoli Peninsula and the near-lying parts of Thrace. I carefully read the available accounts of Sibthorp's journeys and found no evidence that he had botanized on the European side of the Dardanelles. However, while recently studying the distribution of the *Thymelaeaceae* of the Near East, I noted that on p. 258 of Sibthorp and Smith's Prodromus it is recorded that Sibthorp collected *Daphne Tartonraira* (*Thymelaea tartonraira*) "prope Sestum ad Pontum Euxinum." Further investigations also showed that *Crocus aureus* and *Cerastium pentandrum* were stated (l.c. pp. 24, 316) to have been collected near Sestus. The only Sestus, or Sestos, I know or have traced is the ancient and once famous town on the Gallipoli Peninsula, opposite Abydos. The *Crocus aureus* is given as flowering in March, and it was probably in the spring that Sibthorp crossed the Narrows and landed on the Peninsula, possibly for a very short time. We know that he was at Abydos and that he collected many plants in north-west Asia Minor. It is somewhat strange and misleading that the Hellespont (Dardanelles) should be termed the Pontus Euxinus.

W. B. TURRILL.

Methods of Descriptive Systematic Botany.*—As Prof. Hitchcock remarks in his preface, descriptive taxonomy at the present day may be likened to a craft in which the technique has not been committed to writing but is handed down by tradition. Alphonse De Candolle's "La Phytographie" (1880), the only work hitherto devoted to the subject, is now out of date, many new problems and methods having arisen since its publication.

The first part (pp. 1–42) of Prof. Hitchcock's book deals with the elements of descriptive taxonomy, and is followed by chapters on "The Preparation of a Local Flora", "Field, Herbarium and Library", "The Preparation of a Flora or Manual", "The Preparation of a Revision of a Taxonomic Group", "Keys and Synopses", "Publication of Groups", "Homonyms and Synonyms", "Types", and "Codes of Nomenclature". Supplementary chapters deal with "The Grass Herbarium" [of the United States National Museum], "Travelling in Tropical America", and "Miscellaneous Notes". "Rules for Bibliographic Abbreviations" and the text of the "Type-basis Code of Botanical Nomenclature" are given in an Appendix.

The book should be read not only by all beginners in Systematic Botany, but more especially by advanced students, as a preliminary to original taxonomic work. Attention to its recommendations will go far towards eliminating the technical blemishes which too often disfigure a first "Revision". Even an experienced systematist may have something to learn from the chapters on Nomenclature. This subject is treated at considerable length and very clearly, but with a distinct bias in favour of the Type-basis Code. This is apparent in the discussion of the "Chief Differences between the Type-basis Code and the International Rules" (pp. 162–5). One of the fundamental principles of botanical nomenclature is that no *name* of a group should be regarded as effectively published unless it is accompanied by, or is associable with a *description* of that group. This principle is violated by Art. 2 of the Type-basis Code, under which the mere mention of one or more described *species* (with binary names) is sufficient to validate a new *generic name*, even though the author of the name has not given a description of the new genus, nor stated how it differs from previously described genera. This defect of the Code is not indicated by Prof. Hitchcock, who merely says "The Rules do not admit effective publication in such a case" without giving the reason. At the same time, however, he points out the defect in the International Rules, Art. 38, under which the publication of a generic name is effective even though no species are assigned to the genus. For the proper characterization of a genus both a generic description (as required by the Rules) and a mention of included species (as required by the Code) are necessary. T. A. S.

* By A. S. Hitchcock. 8vo. Pp. vii+216. New York: John Wiley & Sons. London: Chapman & Hall. 1925. Price 12s. 6d. net.

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PLATE VII.

Cupressus Leylandii.

To face page 113.]

BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1926
ROYAL BOTANIC GARDENS, KEW

XV.—A NEW HYBRID CONIFER.

A. BRUCE JACKSON AND W. DALLIMORE.

The occurrence of a chance hybrid between the Yellow Cedar of the Pacific Coast of British Columbia and Oregon (*Cupressus nootkatensis* Don) and the Monterey Cypress (*C. macrocarpa* Hartw.), which has a limited distribution in California, is of more than usual interest from the fact that the parent species are separated geographically and belong to different sections of the genus, or, as some authorities consider, to different genera.

In July last a branch obtained from a cypress growing on the estate of Captain J. M. Naylor at Leighton Hall, near Welshpool, was received at Kew for identification. This specimen had the flattened fern-like sprays of *Cupressus nootkatensis*, but the cones were much larger, being up to $\frac{3}{4}$ inch in diameter, usually separating into eight scales, with about five tubercled seeds to each scale. A hybrid was at once suspected, the fruiting characters, as will be seen from the descriptions below, being exactly intermediate between the two species.

C. macrocarpa. *Cones* 1–1$\frac{1}{2}$ in. diam., 10–14 scales. *Seeds* about 20 on each scale, tubercled, $\frac{1}{6}$ in. diam.

Hybrid. *Cones* $\frac{2}{3}$ to $\frac{3}{4}$ in. diam., usually 8 scales. *Seeds* about 5 on each scale, tubercled, $\frac{1}{5}$ in. diam.

C. nootkatensis. *Cones* $\frac{1}{3}$ in. diam., 4–6 scales. *Seeds* 2 on each scale, non-tubercled, $\frac{1}{4}$ in. diam.

Captain Naylor and his forester, Mr. T. Alexander, have since kindly sent us further specimens from the same tree, which was raised in 1911 from seeds of a cone procured from a tree of *C. macrocarpa* growing about fifty yards from a specimen of *C. nootkatensis*. Two seedlings of this batch appeared different from the rest and were subsequently planted out. One of them, which is now 14 years old and has the habit of *C. nootkatensis*, is now 28 feet high and has borne cones. An instance of hybrid vigour is here seen, for a tree of *C. macrocarpa* from the same seed bed is only 21 feet high although it has received exactly the same treatment.

Captain Naylor also states that his uncle, Mr. C. J. Leyland, of Haggerston Castle, Northumberland, had in 1888 at Leighton Hall collected seeds from a tree of *C. nootkatensis* growing near one of *C. macrocarpa*, the latter standing to the windward of *C. nootkatensis*. From these he raised seedlings which were afterwards transferred to Haggerston. Among them were six which looked

(18807). Wt. 132–21. 1,125. 3/26. Wy. & S., Ltd. Gr: 50 (4).

different from the rest, and one of these differed again from the others in habit, the foliage also being coarser. As they grew up it became evident that they were the result of a natural cross between the species named. These six trees were planted out in various positions, and the best of them is now growing on a lawn with other cypresses and has reached a height of 35 feet (Plate VII). The hybrid has thus arisen independently on two separate occasions.

Specimens from two of the Haggerston trees, one of which bears numerous cones, have since been sent to us by Mr. Leyland. One exactly resembles in cones and foliage the later and reciprocal cross, the female parent being in this case *C. macrocarpa* and the same tree as provided the pollen in the first cross. The other specimen, which has no cones, exhibits a slightly different arrangement of branchlets, which are set more or less at right angles to the shoot, and the tree shews a tendency to a more upright habit of growth, like *C. nootkatensis*. Cuttings from the original hybrid strike freely, and have been distributed to various gardens. We hope eventually to trace these, and study their characteristics. A group of twelve trees raised from cuttings was planted at Kyloe, seven on one side of the road and five on the other, as an anagram of Mr. Leyland's 75th birthday.

It is important to add that both these hybrids are fertile, seedlings of the F.2 generation having been raised; but as we have had no opportunity of studying them we cannot say if they shew signs of Mendelian segregation.

Professor Henry informs us that he attempted to make an artificial cross between these species, but without success. So far as we know there is no previous record of a hybrid *Cupressus*, though Mademoiselle Camus, the monographer of the genus, to whom we sent a specimen of the Leighton plant, thinks they may be less rare than is generally supposed. Most hybrid conifers, which appear to be commonest in the genus *Abies*, have been artificially produced. Mr. M. H. Chapman has recently described a hybrid between *Pinus palustris* and *P. Taeda* which combines the characters of the two parents.

As this new cypress has already been named *Cupressus Leylandii* by Mr. Leyland, we propose to describe it under that name:

Cupressus Leylandii *Jackson & Dallimore* hybr. nov.; (*C. macrocarpa* Hartw. × *C. nootkatensis* Don).

Arbor, altitudine habituque ramulis et foliis complanatis *Cupressi nootkatensis* similis. *Strobili* globosi, usque ad 21 cm. diametro, squamis 8 instructi. *Semina* circiter 5 in squama quaque, complanata, late ovata, ala conspicua inclusa, tuberculis veluti in *C. macrocarpa*, circiter 5 mm. in diametro maxima.

A tree similar in size and habit to *Cupressus nootkatensis*. Foliage with the flattened branchlet system of *C. nootkatensis*. Cones globose, up to $\frac{3}{4}$ in. in diameter, separating into 8 scales.

Seeds about 5 on each scale, flattened, including the conspicuous wing broadly ovate in outline, with tubercles like those of *C. macrocarpa*, about $\frac{1}{5}$ in. in their widest diameter.

Known only in cultivation.

Miss Lister's careful and accurate drawings shew well the intermediate character of the plant.

Cupressus Leylandii (*C. nootkatensis* × *macrocarpa*).
1. branch and cones. 1a. cone. 1b. seeds.
2. *C. macrocarpa* (♀ parent) cone. 3. *C. nootkatensis* (♂ parent) cones.
Drawings by Miss G. Lister. (1, 2, 3 slightly enlarged; 1a, 1b much enlarged.)

XVI.—A NEW SOLANUM FROM WESTERN AUSTRALIA.

G. Bitter (Göttingen) and V. S. Summerhayes.

Solanum Hystrix, to which the new species dealt with below is allied, was first described in 1810 by Robert Brown in his Prodromus Florae Novae Hollandiae, p. 446, from specimens collected at Petrel Bay on the Island of St. Francis off the coast of South Australia, the type now being in the Herbarium of the British Museum.

Since then the species has been recorded from several other localities in South Australia and New South Wales, some of these records being undoubtedly errors.

Some years previous to 1900 Dr. E. Clement gathered a *Solanum* in Western Australia in the district between the Ashburton and De Grey Rivers, where there are several goldfields. This plant was forwarded to Kew and named provisionally *S. Hystrix* R. Br. The same plant was collected again in 1900 in the Coolgardie District and has been gathered since on several occasions in the same region, these specimens also being referred to *S. Hystrix*.

During 1925 a *Solanum* was received at Kew from Mr. W. M. Carne, of the Department of Agriculture, Perth, W.A., on which he communicated the following note :—

"It has long been confused here with *S. Hystrix*, which, however, we have never found in this State. Appearing first, a number of years ago, in our arid goldfields area around Kalgoorlie, it has now spread eastward into the wheat belt, where it has become a very common weed in waste places, on fallow land, and wherever the soil carries sufficient moisture in the summer, but not on virgin country. The flowers vary in colour from lilac to white, and the plant is normally quite prostrate."

This information seemed to suggest that the plant is an alien, but a careful search through the Herbaria at Kew, the British Museum and Berlin failed to find any extra-Australian specimens which agreed with Mr. Carne's plant, and it is therefore considered a new species. Whether it is indigenous to Australia or not is still an open question but the close affinity to *S. Hystrix*, an undoubted native, is significant.

Solanum (Leptostemonum) hoplopetalum *Bitter et Summerhayes* sp. nov.; affinis *S. Hystrici* R. Br. a quo caulibus, foliis, pedunculis pedicellisque dense pilosis differt.

Herbaceum vel suffruticosum; rami superiores circiter 2–3 mm. diametro, subteretes, sordide virides, pilis fere semper simplicibus paucicellularibus (circiter 2–3-cellularibus) acutis gracilibus patentibus et pilis minutis apice glandulosis crebris obsiti, aculeis recte patentibus subacicularibus pallide stramineis valde inaequilongis 2–13 mm. longis densis horridi; internodia circiter 4–6 cm. longa. *Folia* superiora saepe false geminata, inaequalia; petioli circiter 2–3·5 cm. longi, sicut rami pilis satis crebris et aculeis recte patentibus pallide stramineis valde inaequilongis 2–11 mm. longis satis crebris armati; laminae ambitu oblongo-lanceolatae, sinuato-

lobatae vel fere sinuato-pinnatifidae, lobis in utroque latere 4–6 obtusis majoribus obtuse lobulatis, 7–12 cm. longae, 3·5–7 cm. latae, basi valde obliquae, fere medio latissimae, apice subacutae vel obtusiusculae, utrinque sordide virides, in utraque pagina pilis simplicibus gracilibus fere 3-cellularibus acutis satis crebris et pilis minutis apice glandulosis crebris obsitae, et utrinque praecipue in venis venulisque aculeis pallide stramineis acicularibus rectis inaequilongis 2–15 mm. longis satis crebris (subtus paulum brevioribus tamen crebrioribus) subhorridae. *Inflorescentiae* laterales, foliis false geminatis suboppositae, circiter 3–5-florae; pedunculus circiter 2·5–3 cm. longus, rhachis illum continuans circiter 1–1·5 cm. longa; pedicelli primo graciles, circiter 1·5–1·7 cm. longi, serius robustiores, tamen vix longiores, sicut pedunculus rhachisque pilis longioribus fere omnibus simplicibus (raro semel subfurcatim ramosis) acutis 2–3-cellularibus crebris et pilis minoribus vel minutis apice glandulosis densiusculis obtecti, sicut ceterae partes virides aculeis patentibus acicularibus inaequilongis 1–10 mm. longis densiusculis horridi. *Calyx* in statu florifero campanulato-stellatus, fere 9 mm. longus, ejus lobi in statu florifero corollae plus minusve accumbentes 6 mm. longi, 2·5–3 mm. lati, lanceolati, acuti; calyx totus extus pilis simplicibus gracilibus paucicellularibus crebris et aculeis acicularibus satis crebris horridus, intus in lobis aculeis paucis vel raris in loborum vena media vel juxta illam instructus. *Corolla* rotato-campanulata, in statu adulto florum inferiorum verisimiliter magis campanulata, in floribus ultimis minoribus masculis forse magis rotata, florum inferiorum corolla circiter 2 cm. longa, ejus lobi membranis interpetalariis glabris fere usque ad apicem inter se conjuncti, ipsi extus praecipue ad apicem versus pilis simplicibus gracilibus 2–3-cellularibus acutis obsiti et praecipue in venis majoribus aculeis gracilibus tenuiter acicularibus inaequilongis (ad 2·5 vel 3 mm. longis) acutis apice eglandulosis crebriusculis armati (parcius quoque aculeis minutis in mesophyllo oriundis), lobi in apice ipso et in margine apicali papillis brevibus densis instructi. *Filamenta* circiter 1·5 mm. supra corollae basim oriunda, fere 1·5–1·8 mm. longa, gracilia, glabra; antherae lanceolato-ellipsoideae, circiter 6·5 mm. longae, paulo supra basim subcordatam circiter 2 mm. latae, ad apicem obtusum paulum emarginatum versus nonnihil attenuatae, poris parvis apicalibus. *Ovarium* hemisphaerico-subglobosum, circiter 3 mm. diametro, 2–2·5 mm. altum, in parte inferiore glabrum, in parte apicali aculeis parvis nonnullis apice in glandulam minutam exeuntibus et pilis minutis simplicibus apice glandulosis paucis instructum. *Stylus* circiter 10 mm. longus, in parte basilari aculeolo parvo uno alterove apice glanduloso et pilis minutis apice glandulosis perpaucis praeditus, ceterum glaberrimus, in parte apicali manifeste incurvatus; stigma styli apice manifeste crassius, obtusum, bilobum. *Calyx fructifer* manifeste auctus, in parte inferiore connata fere hemisphaerica baccae arcte accumbens diametro circiter 15–16 mm., lobis 5

triangularibus acutis circiter 7 mm. longis basi 7–8 mm. latis baccae partem superiorem laxe amplectentibus, extus in tota superficie (etiam in lobis) aculeis pallide stramineis rectis densis valde inaequilongis usque ad 9–10 mm. longis horridus. *Bacca* subglobosa, circiter 14–15 mm. diametro, sordide viridinigrescens (in statu sicco). *Semina* oblique reniformia, lenticulariter applanata, 3 mm. longa, 2·5 mm. lata, et 0·5 mm. crassa, minute reticulata, sordide nigricantia.

Western Australia. Merredin, May, 1925, with flowers and fruits, *E. J. Limbourne* (Herb. Kew.) (type): between the Ashburton and De Grey Rivers, *E. Clement*: Coolgardie District, Londonderry, Oct. 1900, *E. Kelso*: Dedari, No. 8 Pumping Station, c. 300 m. alt., Sept. 1903, *G. H. Thiselton-Dyer* 112 (Herb. Kew.): Yilgarn, near Southern Cross, barren places of dense bush on laterite, *Diels* 1706 (Herb. Berol.).

S. Hystrix R. Br. differs from *S. hoplopetalum* in the glabrousness of the green parts, but the two species agree with one another in the presence of aculeoli on the outside of the corolla lobes. Their distribution, however, as far as is known, is quite different, *S. Hystrix* being found in South Australia and New South Wales, whereas *S. hoplopetalum* is known only from Western Australia.

S. hoplopetalum is the only Australian species of the subgenus *Leptostemonum* possessing almost invariably simple hairs; very rarely a hair with a single lateral (not basal) branch was observed among innumerable unbranched typical hairs.

XVII.—AD DIOSCOREARUM ORIENTALIUM HISTORIAM COMMENTARII.

D. Prain et I. H. Burkill.

Adversaria haec nostra in generis *Dioscoreae* specierum investigatione versantur; imprimis quaerundam ex exemplaribus in herbario Dahlemensi servatis a doctoribus cel. Uline et Knuth prolatarum; deinde nonnullarum a nobis propositarum. Materiei ope herbario horti Kewensis commodatae nobis judicandi nomina trivialia nonnulla inutilia esse facultas dabatur. Maximas ob hoc ill. doctore L. Diels horti Berolinensis praesidi gratias agimus.

Dioscorea angulata R. Knuth in Engl., Pflanzenr., iv–43, (1924) p. 283, a **Dioscorea nummularia** *Lamk*, vix aut omnino non distinguenda.

Dioscorea camphorifolia Uline ex R. Knuth in op. cit. p. 288, eadem est ac **Dioscorea cirrhosa** *Lour*.

Dioscorea firma R. Knuth in op. cit. p. 141, nihil est nisi **Dioscoreae kamoonensis** *Kunth* varietas quaedam, etsi ob habitum exempli prolati sterilem omnino non cognoscenda.

Dioscorea formosana R. Knuth in op. cit. p. 268, species terminis vix certis circumscripta videtur. Exempla profert auctor cel. duo: alterius (*Warburg* 9682) radicem ipso repertore ill.

teste tinctoriam praebentis, caulis nondum maturatus subcrassus folia duo tantum exhibet: alterius (*Warburg* 9860) forsan diversae speciei referendi caulis pertenuis folia quattuor ostendit.

Dioscorea glaucoidea R. Knuth in op. cit. p. 284, stirps *Dioscoreae angulatae* R. Knuth fœmina est itaque nostrapte sententia melius sub **Dioscoream nummulariam** *Lamk* citanda sit.

Dioscorea kelungensis R. Knuth in op. cit. p. 263, medicamentum sinensibus Shan-yu-tsai praebens sane ut indicat auctor cel. forma est propria, melius tamen judicio nostro pro varietate **Dioscoreae japonicae** *Thunb.* quam pro specie diversa habenda.

Dioscorea kiangsiensis R. Knuth in Fedde, Repert. Sp. Nov., 21, (1925) p. 80, eadem est ac **Dioscorea belophylloides** *Prain et Burkill.*

Dioscorea korrorensis R. Knuth in Engl. Pflanzenr. iv–43, (1924) p. 190, eadem est ac **Dioscorea bulbifera** *Linn.*

Dioscorea Ledermanni R. Knuth in op. cit. p. 188, cum **Dioscorea flabellifolia** *Prain et Burkill*, ad amussim quadrat. Vocabulum vernaculum "detachel" communicat *Dioscorea flabellifolia* cum *D. nummularia*: cibaria utriusque rhizomata. Etiam *Dioscoreae piscatorum* veneno elixatura obsito rhizomatibus vescuntur gentes Sakai saltuum principatus Pahangensis incolae.

Dioscorea lufensis R. Knuth in op. cit. p. 272, indicio exempli folia tantum gerentis secreta vix a **Dioscorea nummularia** *Lamk* distinguenda.

Dioscorea Maximowiczii R. Knuth in op. cit. p. 178, eadem est ac **Dioscorea tenuipes** *Franchet et Savatier.*

Dioscorea mindanaensis R. Knuth in op. cit. p. 271, species ope exempli sterilis sine cognationis professione statuta, dubia igitur atque incerta manet.

Dioscorea neglecta R. Knuth in op. cit. p. 263, eadem est ac *Dioscorea kelungensis* R. Knuth (**Dioscorea japonica** *Thunb.*, var. **kelungensis** nobis).

Dioscorea oxyphylla R. Knuth in op. cit. p. 269, eadem est ac **Dioscorea divaricata** *Blanco.*

Dioscorea palauensis R. Knuth in op. cit. p. 191, a **Dioscorea nummularia** *Lamk* vix aut omnino non distinguenda.

Dioscorea platanifolia Prain et Burkill in Kew Bull. 1925, p. 60, eadem est ac **Dioscorea althaeoides** *R. Knuth.*

Dioscorea rangunensis R. Knuth in Engl., Pflanzenr. iv–43, (1924) p. 320, eadem est ac **Dioscorea birmanica** *Prain et Burkill.*

Dioscorea Raymundii R. Knuth in op. cit. p. 191, indicio exempli folia tantum gerentis secreta vix a **Dioscorea nummularia** *Lamk* distinguenda.

Dioscorea rotundifoliolata R. Knuth in op. cit. p. 142, nihil est nisi **Dioscoreae kamoonensis** *Kunth* varietas quaedam, sed ob habitum, exempli prolati sterilem vix cognoscenda.

Dioscorea Saidae R. Knuth in op. cit. p. 317, eadem est ac **Dioscorea Tokoro** *Makino*.

Dioscorea Seniavinii Prain et Burkill, in Kew Bull. 1925, p. 59, eadem est ac **Dioscorea Huii** *R. Knuth*.

Dioscorea Tenii R. Knuth in Engl., Pflanzenr., iv–43 (1924) p. 142, eadem est ac **Dioscorea melanophyma** *Prain et Burkill*. Inflorescentia laxa est.

Dioscorea undulata R. Knuth in op. cit. p. 315, eadem videtur ac **Dioscorea hypoglauca** *Palibin*.

Dioscorea Wichurae Uline ex R. Knuth in op. cit. p. 316, eadem est ac **Dioscorea Tokoro** *Makino*.

XVIII.—REVISION OF SIBTHORP'S PLANTS AT KEW.

H. K. A. Shaw and W. B. Turrill.

In the Alexander Prior Herbarium, which was bequeathed to Kew in 1906, were a number of specimens "ex Herb. Sibthorp". It was obvious that these were of considerable importance, not merely to Kew, but as supplementing the Sibthorp collection at Oxford. With the help of Dr. G. C. Druce the plants were checked against those at Oxford, and two species, *Dianthus serratifolius* S. et S. and *Lysimachia anagalloides* S. et S., were found to be missing from Herb. Sibthorp proper. These have been presented officially to Oxford for incorporation in the separate Sibthorp collection. The remaining specimens have been mounted and laid in the general herbarium at Kew. Since many of them are types, a complete enumeration of them is published below as a small contribution to the complete revision of Sibthorp's collections, which is badly needed. We have limited ourselves to relevant synonymy and references. The species mentioned in this paper are arranged in the sequence of Sibthorp and Smith's Prodromus, and the number prefixed to each is that given by Smith. The localities when quoted without comment are abstracted *verbatim* from the Prodromus.

5. **Corispermum filifolium** *C. A. Mey.* ex Becker in Bull. Soc. Nat. Mosc. xxxiii. Pt. I., 13 (1858). *C. hyssopifolium* S. et S. Prodr. i. 2 (1806), non Linn.

Sibthorp's specimens were collected by the Black Sea mouth of the Bosporus, near Fanar and on the Cyanean islets. The description appended has been drawn up exclusively from the sheet obtained from the Alexander Prior collection. In the Sibthorp herbarium at Oxford there are three sheets of this species apparently representing two individuals, the one with laxer inflorescences, such as is described below, and the other with denser spikes and overlapping bracts.

At Kew there are three gatherings of *C. filifolium* all from Sarepta and collected by Becker. These differ from the Sibthorp specimens only in having slightly more slender branchlets and somewhat smaller bracts. The fruits show the closest possible agreement. At the British Museum (Natural History) we have seen the following sheets which we consider to belong to this species:—*Herb. Pallas*, named "Corisp. hyssopifol. varietas maxima elongata"; *A. Becker*, Plantae astrachanicae: Sarepta, in arenosis montium, 20 Aug. 1879 (the top right-hand specimen ; the other plant on the same sheet is *Corispermum nitidum* Kit.); *Janka*, in arena mobili pr. pag. Fényszaru districtus Jasygorum in Hungaria centrali (named "Corispermum hyssopifolium L."); *M. Pallis*, Flora Dobrogea: Letea, delta of Danube (named "Corispermum nitidum Kit."). Pallas received specimens from Sibthorp [see Trans. Linn. Soc. x. 257 (1811)] and it is possible that the sheet quoted above represents one of them.

It is very probable that the plants referred to *C. hyssopifolium* [var.] γ *remotiflorum* Lusus 2 by Fenzl [in Ledeb. Flor. Ross. iii. 760–1 (1849–51)], are, at least in part, *C. filifolium* C. A. Mey. The figure in Pall. Fl. Ross. ii. t. 98, f.E (1788) also appears—as pointed out by Fenzl (*op. cit.* p. 761)—to represent the same species.

Since the name was published accompanied by only a meagre diagnosis in German, we give below a Latin description of Sibthorp's specimen in Herb. Kew.

Planta glaberrima, procumbens vel adscendens, ut videtur debilis; caulis attamen crassiusculus (c. 1·5 mm. diam.), subangulatus vel striatus; ramuli fructiferi patentes, interdum recurvi, elongati, circiter 1 dm. longi. *Bracteae* omnes vel paene omnes usque ad basin ramulorum floriferae, nullo modo ramulorum apicem versus densius aggregatae, sed inflorescentiae laxae, graciles, apice singulae bracteae—saepe etiam ad apicem ramulorum—basin proximae vix praeeunte; superiores ovato-lanceolatae, 2·5–3 mm. latae et 6–7 mm. longae, inferiores angustius lineares, 1·0–1·5 mm. latae et 10–12 mm. longae. *Fructus* late ellipticus vel late elliptico-obovatus, major latiusque alatus quam in *C. hyssopifolio* L. typico, 4·5–5 mm. longus, 3–3·25 mm. latus (ala inclusa); ala circiter 0·7 mm. lata, apice non vel vix emarginata; styli breviusculi, circiter 0·7 mm. longi, acuto angulo divaricati vel interdum conniventes.

47. **Salvia pomifera** *L.* Sp. Pl. 24 (1753). S. et S. Prodr. i. 13 (1806) et Fl. Gr. t. 15 (1806); Hal. Consp. Fl. Gr. ii. 481 (1902). "In collibus apricis et asperis Cretae. In Graeciâ vulgaris."

53. **Salvia amplexicaulis** *Lamk.* Ill. i. 68 (1791) sensu Reichb. Flor. Germ. Excurs. 860 (1832). Presumably this is the plant quoted in S. et. S. Prodr. i. 15 (1806) under *S. sylvestris*, collected "in agro Byzantino". A later name, but one which may ultimately have to be adopted, is *S. villicaulis* Borbás.

59. **Salvia controversa** *Ten.* Syll. p. 18 (1831); Boiss. Fl. Or. iv. 630 (1879). *S. clandestina* S. et S. Prodr. i. 16 (1806) et Fl. Gr. t. 24 (1806), non Linn. "In arvis insulae Cypri frequens."

67. **Morina persica** *L.* Sp. Pl. 28 (1753); S. et S. Prodr. i. 18 (1806) et Fl. Gr. t. 28 (1806); Hal. Consp. Fl. Gr. i. 756 (1901). "In montibus Parnasso et Cylleni, ad campos elatos fertiliores."

87β. **Gladiolus triphyllus** *S. et S.* Prodr. i. 25 (1806) et Fl. Gr. t. 38 (1806); Holmboe, Studies on the vegetation of Cyprus, 54 (1914). According to Sibthorp this was found by Bauer on Troodos.

107. **Cyperus fuscus** *L.* Sp. Pl. 46 (1753); S. et S. Prodr. i. 32 (1806) et Fl. Gr. t. 48 (1806); Hal. Consp. Fl. Gr. iii. 302 (1904). "In depressis humidis frequens, inter Smyrnam et Bursam, et circa Byzantium."

108. **Juncellus pannonicus** *C.B.Cl.* in Kew Bull. Addit. Ser. viii. 3 (1908). *Cyperus pannonicus* Jacq. Fl. Austr. v. App. 29, t. 6 (1778); S. et S. Prodr. i. 32 (1806). "Ad maris Euxini littora".

116. **Fimbristylis dichotoma** *Vahl* Enum. ii. 287 (1806) ("*dichotomum*" perperam); Hal. Consp. Fl. Gr. iii. 307 (1904). *Scirpus dichotomus* L. Sp. Pl. 50 (1753); S. et S. Prodr. i. 34 (1806) et Fl. Gr. t. 50 (1806). "In arenosis maritimis Thraciae, ad Pontum Euxinum propè *Fanar* et Cyaneas insulas".

121. **Cornucopiae cucullatum** *L.* Sp. Pl. 54 (1753). *Cornucopia cucullata* S. et S. Prodr. i. 35 (1806) et Fl. Gr. t. 51 (1806). "In insulâ Patmo."

132. **Phalaris paradoxa** *L.* Sp. Pl. ed. 2. 1665 (1763); S. et S. Prodr. i. 39 (1806) et Fl. Gr. t. 38 (1806); Hal. Consp. Fl. Gr. iii. 340 (1904). "In arvis Graeciae cum Ph. canariensi frequens."

140. **Panicum repens** *L.* Sp. Pl. 87 (1753); S. et S. Prodr. i. 41 (1806) et Fl. Gr. t. 61 (1806); Hal. Consp. Fl. Gr. iii. 334 (1904). "Ad ripas fluvii prope Plataniam in insulâ Cretâ, Junio florens."

149. **Alopecurus lanatus** *S. et S.* Prodr. i. 43 (1806). "In summitate montis Olympi Bithyni, nive peractâ."

181. **Sclerochloa dura** *P. Beauv.* Agrost. 98 (1812); Hal. Consp. Fl. Gr. iii. 411 (1904). *Cynosurus dura* L. Sp. Pl. 72 (1753). *Poa dura* Scop. Fl. Carn. ed. 2. i. 70 (1772); S. et S. Prodr. i. 53 (1806). "In Achaiâ, et in insulâ Cypro."

214. **Dactylis glomerata** *L.* Sp. Pl. 71 (1753) var. **Sibthorpii** *Boiss.* Fl. Or. v. 596 (1884). *D. hispanica* Roth. var. *Sibthorpii* Hack. in Oesterr. Bot. Zeitschr. xxviii. 192 (1878). *D. glomerata L.* var. *dactyloides* Hal. Consp. Fl. Gr. iii. 383 (1904). *Festuca dactyloides* S. et S. Prodr. i. 61 (1806) et Fl. Gr. t. 81 (1806). "In Archipelagi insulis rariùs. Junio lecta in Meli vineis."

294. **Pterocephalus papposus** *Coult.* Dipsac. 45 (1823) p.p. quoad plant. cret. sensu Hal. Consp. Fl. Gr. i. 762 (1901) non sensu Nyman. *Scabiosa papposa* L. Sp. Pl. 101 (1753). *Scabiosa involucrata* S. et S. Prodr. i. 84 (1806) et Fl. Gr. t. 112 (1813). "In Cretae et Cypri collibus."

313. **Asperula nitida** *S. et S.* Prodr. i. 89 (1806) et Fl. Gr. t. 124 (1813); Hal. Consp. Fl. Gr. i. 735 (1901); Boiss. Fl. Or. iii. 39 (1875). "In summitate montis Olympi Bithyni, nive peractâ florens."

331. **Galium floribundum** *S. et S.* Prodr. i. 94 (1806) et Fl. Gr. t. 134 (1813). "In insulâ Cypro."

369. **Elaeagnus angustifolia** *L.* Sp. Pl. 121 (1753); S. et S. Prodr. i. 105 (1806) et Fl. Gr. t. 512 (1813); Hal. Consp. Fl. Gr. iii. 82 (1904). "In insulâ Samo, et inter Bursam et Smyrnam."

402. **Lithospermum hispidulum** *S. et S.* Prodr. i. 114 (1806) et Fl. Gr. t. 162 (1813); Hal. Consp. Fl. Gr. 347 (1902). "In insulâ Rhodo."

409. **Anchusa aggregata** *Lehm.* Asp. 219, t. 47 (1818); Hal. Consp. Fl. Gr. ii. 328 (1902). *A. parviflora* S. et S. Prodr. i. 117 (1806) et Fl. Gr. t. 167 (1813), non Willd. "Prope Athenas."

411. **Anchusa caespitosa** *Lam.* Encycl. i. 504 (1785) (modo "*cespitosa*"); S. et S. Prodr. i. 117 (1806) et Fl. Gr. t. 169 (1813); Hal. Consp. Fl. Gr. ii. 328 (1902). "In Cretae montibus Sphacioticis."

424. **Onosma erectum** *S. et S.* Prodr. i. 121 (1806) et Fl. Gr. t. 173 (1813) (utroque opere "*erecta*" perperam); Hal. Consp. Fl. Gr. ii. 333 (1902); Lacaita in Journ. Linn. Soc. xlvi. 398–9 (1924). In the Prodromus and Flora Graeca the locality is given as "In montibus Cretae elatioribus", but this probably does not apply to the specimens. The plants are the var. *pubiflorum* of Halácsy. On the Kew sheet there are three specimens of *O. erectum* and one of *O. frutescens* Lamk.

436. **Echium angustifolium** *Mill.* Gard. Dict. ed. 8 (1768); Lacaita in Journ. Linn. Soc. xliv. 386, 389 (1919). *E. hispidum* S. et S. Prodr. i. 125 (1806) et Fl. Gr. t. 181 (1813). *E. elegans* Lehm. Asp. 459 (1818); Hal. Consp. Fl. Gr. ii. 338 (1902). Lacaita gives a full account of this plant. Our specimen agrees with Sibthorp's t. 181 and with the Greek and Cretan material at Kew. "In agro Neapolitano novam hanc speciem invenit Sibthorp. *Herb. Banks.*"

493. **Campanula Celsii** *DC.* Monogr. Campan. 217 (1830). *C. tomentosa* Vent. descr. pl. jard. Cels 18, t. 18 (1800); Heldr. in Bot. Centralbl. xliv. 213 (1890) non Lamk. *C. laciniata* S. et S. Prodr. i. 141 (1806), non Linn. "In rupibus umbrosis Graeciae rariùs". It is possible that *C. rupestris* S. et S., *C. Celsii* DC. and *C. Andrewsii* DC. are all varieties of one species to which the name *C. rupestris* has apparently to be given on the basis of priority.

506. **Laurentia tenella** *DC.* Prodr. vii. 410 (1838); Hal. Consp. Fl. Gr. ii. 281 (1902). *Lobelia tenella* Biv. cent. i. 53, t. 2 (1806). *Lobelia setacea* S. et S. Prodr. i. 145 (1806) et Fl. Gr. t. 221 (1819). "In Cretae et Cypri uliginosis."

527. **Verbascum spinosum** *L.* Sp. Pl. ed. 2. 254 (1762); S. et S. Prodr. i. 151 (1806) et Fl. Gr. t. 229 (1819); Hal. Consp. Fl. Gr. ii. 395 (1902). "In montibus Cretae elatioribus."

534. **Mandragora officinarum** *L.* Sp. Pl. 181 (1753) var. **autumnalis** (comb. nov.?). *Mandragora autumnalis* Bertol. ex Spreng. Syst. i. 699 (1825); Vierhapper in Oesterr. Bot. Zeitschr. lxv. 128 (1915), who quotes Bertoloni, Elench. pl. viv. 6, for the first appearance of the name. We have not seen this work. Sibthorp and Smith, Prodr. i. 153 (1806) et Fl. Gr. t. 232 (1819), use the name *Atropa Mandragora* for plants collected "in agro Eliensi et prope Athenas. In insulis Graecis non rara." Sibthorp's specimen at Kew does not exactly agree with that figured in Fl. Gr. t. 232, but is certainly the *Mandragora autumnalis* sensu Vierhapper.

575. **Apocynum venetum** *L.* Sp. Pl. 213 (1753); S. et S. Prodr. i. 166 (1806). "In arenosis maritimis Ponti Euxini prope Byzantium."

598. **Cressa cretica** *L.* Sp. Pl. 223 (1753); S. et S. Prodr. i. 171 (1806) et Fl. Gr. t. 256 (1819); Hal. Consp. Fl. Gr. ii. 309 (1902). "In littoribus salsis Archipelagi frequens."

883. **Thymelaea tartonraira** *All.* Fl. Ped. i. 133 (1785) (modo "*Thymaelaea tarton-raira*") var. **argentea** *Shaw et Turrill* (comb. nov.). *Daphne argentea* S. et S. Prodr. i. 258 (1806) et Fl. Gr. t. 355 (1823). We have not exactly matched this plant in the herbaria at Kew and the Natural History Museum. On the Sibthorpian sheet from the Alexander Prior Herbarium are two specimens. One is *Thymelaea Tartonraira* nearly typical and the other is the var. *argentea* as figured and as represented in the Sibthorp Herbarium at Oxford. The Cretan plants referred by Halácsy to *T. argentea* are not the same, having longer and narrower and more silky leaves. The following paragraph from the Prodromus is of doubtful truth for the var. *argentea* : "In Archipelagi insulis rariùs. In Salami et Samo legit Sibthorp; copiosiùs verò circa Corinthum." Just what the var. *angustifolia* D'Urv. Enumer. 42 (1822) may be we are not sure.

886. **Daphne Gnidium** *L.* Sp. Pl. 357 (1753); S. et S. Prodr. i. 259 (1806) et Fl. Gr. t. 356 (1823); Hal. Consp. Fl. Gr. iii. (1904). "In montosis et asperis Graeciae . . . frequens."

888. **Daphne oleoides** *Schreb.* Dec. i. 13, t. 7 (1766) var. **glandulosa** *Hal.* Consp. Fl. Gr. iii. 78 (1904). *D. oleoides* S. et S. Prodr. i. 260 (1806). *D. glandulosa* Bert. Amoen. 356 (1819). "In montibus Sphacioticis elatioribus Cretae, et in Olympi Bithyni cacumine".

890. **Daphne sericea** *Vahl* Symb. i. 28 (1790); S. et S. Prodr. i. 261 (1806); Hal. Consp. Fl. Gr. iii. 78 (1904). "In Cretae montibus Sphacioticis."

898. **Acer creticum** *L.* Sp. Pl. ed. 2. 1497 (1763) var. **obtusifolium** *Boiss.* Fl. Or. i. 951 (1867). *Acer obtusifolium* S. et S. Prodr. i. 263 (1806) et Fl. Gr. t. 361 (1823). "In montibus Sphacioticis Cretae."—The specimen has larger leaves than any other wild material of the species at Kew.

922. **Haplophyllum Buxbaumii** *G. Don* Gen. Syst. i. 780 (1831), (modo "*Aplophyllum*"). *Ruta Buxbaumii* Poir. Enc. vi. 336 (1804). *Ruta linifolia* S. et S. Prodr. i. 273 (1806), non L. *Ruta spathulata* S. et S. Fl. Gr. t. 370 (1823). "In insulâ Cypro, atque in variis Graeciae locis."

926. **Arbutus Andrachne** *L.* Sp. Pl. ed. 2. 566 (1762); S. et S. Prodr. i. 274 (1806) et Fl. Gr. t. 374 (1823); Hal. Consp. Fl. Gr. ii. 283 (1902). "In montibus circa Athenas . . .; nec non in Archipelagi insulis, et inter Smyrnam et Bursam. In Cypro vulgaris."

949. **Gypsophila polygonoides** *Hal.* Consp. Fl. Gr. i. 190 (1901). *Cucubalus polygonoides* Willd. Sp. Pl. ii. 690 (1799). *Gypsophila ocellata* S. et S. Prodr. i. 281 (1806) et Fl. Gr. t. 387 (1823). "In Delphi monte Euboeae."

953. **Velezia rigida** *L.* Sp. Pl. 332 (1753); S. et. S. Prodr. i. 283 (1806) et Fl. Gr. t. 390 (1823); Hal. Consp. Fl. Gr. i. 218 (1901). "In Cretâ et Cypro insulis."

954. **Velezia quadridentata** *S. et S.* Prodr. i. 283 (1806) et Fl. Gr. t. 391 (1823); Hal. Consp. Fl. Gr. i. 218 (1901). "In Asiâ minori."

961. **Dianthus diffusus** *S. et S.* Prodr. i. 285 (1806) et Fl. Gr. t. 396 (1823); Hal. Consp. Fl. Gr. i. 205 (1901). "In insulâ Cypro." Also a specimen of the same but with a label "Dianthus pubescens Sm. Tenedos." The specimen is not *D. pubescens* S. et S., nor is this species recorded from Tenedos in the Prodromus, but only "in montibus circa Athenas."

963. **Dianthus tripunctatus** *S. et S.* Prodr. i. 286 (1806) et Fl. Gr. t. 398 (1823); Hal. Consp. Fl. Gr. i. 217 (1901). No locality is given on the label, but according to Sibthorp it was collected "in insulâ Cypro."

967. **Dianthus crinitus** *Smith* in Trans. Linn. Soc. ii. 300 (1794); Willd. Sp. Pl. ii. 678 (1799); S. et S. Prod. i. 287 (1806) et Fl. Gr. t. 401 (1825). "In insulâ Cypro."

972. **Dianthus haematocalyx** *Boiss.* Diagn. II. i. 65 (1853) var. **alpinus** *Boiss.* Fl. Or. i. 503 (1867). *D. alpinus* S. et S. Prodr. i. 288 (1806); Williams in Journ. Linn. Soc. xxix. 419 (1893), quoad plantam graecam non Linn. No locality is given, but according to Sibthorp he collected it "in montibus Graeciae."

974. **Dianthus fruticosus** *L.* Sp. Pl. 413 (1753); S. et S. Prodr. i. 289 (1806) et Fl. Gr. t. 407 (1825); Hal. Consp. Fl. Gr. i. 201 (1901). No locality is given on the label, but Sibthorp quotes it from Seriphos and Crete.

990. **Silene laevigata** *S. et S.* Prodr. i. 295 (1806) et Fl. Gr. t. 418 (1825). On the sheet is wrongly written "Graecia". The species was collected by Sibthorp "in insulae Cypri montosis."

1001. **Silene sedoides** *Poir.* Voy. Barb. ii. 164 (1789); Hal. Consp. Fl. Gr. i. 174 (1901). *S. ramosissima* S. et S. Prodr. i. 297 (1806) et Fl. Gr. t. 435 (1825). Written up "Graecia," but collected by Sibthorp " in rupibus maritimis Cretae."

1003. **Silene atocion** *Jacq.* Hort. Vind. iii. 19, t. 32 (1776). *S. orchidea* L. f. Suppl. 241 (1781); S. et S. Prodr. i. 297 (1806) et Fl. Gr. t. 427 (1825). ? *Cucubalus aegyptiacus* L. Sp. Pl. 415 (1753). Wrongly written up "Graecia"; collected by Sibthorp "in Cypri campestribus."

1008. **Silene fruticosa** *L.* Sp. Pl. 417 (1753); S. et S. Prodr. i. 299 (1806) et Fl. Gr. t. 428 (1825); Boiss. Fl. Or. i. 633 (1867); Rohrb. Mon. Gatt. *Sil.* 226 (1868); Hal. Consp. Fl. Gr. i. 181 (1901). On the label is written "Graecia" but Sibthorp only gives "in rupibus insulae Cypri." The species is well known from Sicily, whence Linnaeus records it, and from Gozo. At Kew specimens also occur from Karpatos, Kassos and Cyprus. On the whole these have small and often more spathulate leaves, while Sibthorp's specimen is even more extreme in this direction. We are, however, unable to find any definite morphological differences. According to Boissier and Rohrbach, *opp. citt.*, the species also occurs "in Peloponneso ad Scardamula (Despr.)".

1009. **Silene rigidula** *S. et S.* Prodr. i. 299 (1806) et Fl. Gr. t. 430 (1825); Hal. Consp. Fl. Gr. i. 172 (1901). "In monte Hymetto, prope Athenas."

1018. **Silene falcata** *S. et S.* Prodr. i. 301 (1806) et Fl. Gr. t. 436 (1825). "In monte Olympo Bithyno."

1082. **Peganum Harmala** *L.* Sp. Pl. 312 (1753); S. et S. Prodr. i. 319 (1806) et Fl. Gr. t. 456 (1825). "Circa Athenas, et in insulâ Cretâ."

1089. **Aremonia agrimonoides** *DC.* Prodr. ii. 588 (1825). *Agrimonia agrimonoides* L. Sp. Pl. 448 (1753); S. et S. Prodr. i. 322 (1806) et Fl. Gr. t. 458 (1825). "In Parnasso monte."

1133. **Myrtus communis** *L.* Sp. Pl. 471 (1753); S. et S. Prodr. i. 336 (1806) et Fl. Gr. t. 475 (1825); Hal. Consp. Fl. Gr. i. 547 (1901). "In Graeciâ, insulisque Archipelagi, vulgaris."

1136. **Amygdalus orientalis** *Mill.* Gard. Dict. ed. 8 (1768) var. **discolor** *Spach* in Ann. Sci. Nat. sér. 2. xix. 119 (1843) e descriptione. *A. incana* S. et S. Prodr. i. 337 (1806) et Fl. Gr.

t. 477 (1825) non Pall. *A. discolor* Roemer Syn. monogr. iii. 12 (1847). *Prunus discolor* Schneider Illustr. Handb. Laubh. i. 591 (1905). The specimen is written up "Amygdalus incana" and agrees well with the figure. The locality is given as "ad viam inter Smyrnam et Bursam." Boissier in Flor. Or. ii. 647 (1872) wrongly quotes Sibthorp's plant and figure under *Cerasus incana*.

1321. **Thymbra spicata** *L.* Sp. Pl. 568 (1753); S. et S. Prodr. i. 398 (1806) et Fl. Gr. t. 546 (1826–27); Hal. Consp. Fl. Gr. ii. 557 (1902). "In Achaiae, Cretae, et Asiae minoris, collibus siccis."

1380. **Phlomis pungens** *Willd.* Sp. Pl. iii. 121 (1801); Hal. Consp. Fl. Gr. ii. 509 (1902). *P. herba venti* S. et S. Prodr. i. 415 (1806), quoad plantam graecam et Fl. Gr. t. 564 (1827) non L. "Prope Athenas; nec non in Asiâ minori inter Smyrnam et Bursam."

1618. **Althaea acaulis** *Cav.* Diss. 93 (1786). *Alcea acaulis* S. et S. Prodr. ii. 44 (1813). Given as "in Graeciâ ex herb. Sibth. at locus specialis non annotatus est." Halácsy, Consp. i. 264 (1900), says the species is certainly given erroneously for Greece.

1641. **Polygala venulosa** *S. et S.* Prodr. ii. 52 (1813) et Fl. Gr. t. 669 (1830); Hal. Consp. Fl. Gr. i. 146 (1901). No locality is given on the label, but the species was originally described as collected "in insulae Cypri, nec non in Argolidis et Laconiae, montibus."

1647. **Genista acanthoclada** *DC.* Mém. Lég. vi. 208 (1825) et Prodr. ii. 146 (1825). *Spartium horridum* S. et S. Prodr. ii. 54 (1806) et Fl. Gr. t. 674 (1830), non Vahl. "In Graeciae et Archipelagi montibus".

1780. **Ebenus Sibthorpii** *DC.* Mém. Lég. vii. 352, t. 53 (1825); Hal. Consp. Fl. Gr. i. 461 (1901). *E. pinnata* S. et S. Prodr. ii. 92 (1813) et Fl. Gr. t. 740 (1833) non Aiton sensu Desf. "In Athô et Parnasso montibus."

1834. **Trigonella cariensis** *Boiss.* Diagn. I. ii. 21 (1843). *T. foenum-graecum* S. et S. Prodr. ii. 109 (1813) et Fl. Gr. t. 766 (1833) non Linn. "In monte Hymetto prope Athenas rariùs. In littore Cariensi copiosè; ut etiam in Rhodo et Cypro insulis."

1900. **Chondrilla ramosissima** *S. et S.* Prodr. ii. 128 (1813) et Fl. Gr. t. 795 (1833); Hal. Consp. Fl. Gr. ii. 204 (1902). "Prope Athenas."

2008. **Atractylis cancellata** *L.* Sp. Pl. 830 (1753); Hal. Consp. Fl. Gr. ii. 99 (1902). *Acarna cancellata* All. Fl. Ped. i. 153 (1785); S. et S. Prodr. ii. 159 (1813) et Fl. Gr. t. 839 (1837). "In Cretâ, Cypro et Rhodo insulis, nec non in agro Argolico."

2016. **Staehelina uniflosculosa** *S. et S.* Prodr. ii. 162 (1813) et Fl. Gr. t. 896 (1837); Hal. Consp. Fl. Gr. ii. 101 (1902). "In monte Parnasso."

2024. **Diotis maritima** *Cass.* in Dict. Sci. Nat. xiii. 295 (1819); Hal. Consp. Fl. Gr. ii. 39 (1902). *Filago maritima* L. Sp. Pl. 927 (1753). *Santolina maritima* Sm. Fl. Brit. iii. 860 (1800–04); S. et S. Prodr. ii. 165 (1813) et Fl. Gr. t. 850 (1837). "In Archipelagi maritimis frequens."

2121. **Achillea aegyptiaca** *L.* Sp. Pl. 900 (1753); S. et S. Prodr. ii. 193 (1813) p.p.; sensu Hal. Consp. Fl. Gr. ii. 50 (1902). *A. Tournefortii* DC. Prodr. vi. 28 (1837) p.p. sensu Boiss. Fl. Or. iii. 260 (1875). The specimen is probably the one collected by Sibthorp "in . . . scopulo *Caloyero* dicto."

2140. **Centaurea spinosa** *L.* Sp. Pl. 912 (1753); S. et S. Prodr. ii. 199 (1813) et Fl. Gr. t. 902 (1840); Hal. Consp. Fl. Gr. ii. 151 (1902). "In Cretae et Helenae insularum arenosis maritimis, et prope Athenas."

2260. **Quercus Ilex** *L.* Sp. Pl. 995 (1753); S. et S. Prodr. ii. 239 (1813). *Q. Smilax* L. Sp. Pl. 994 (1753); Hal. Consp. Fl. Gr. iii. 131 (1904). "In Peloponneso; nec non in monte Athô, et in insulâ Cretâ."

2262. **Quercus macedonica** *DC.* Prodr. xvi. 2. 50 (1864). *Q. Aegilops* Griseb. Spic. Fl. Rum. ii. 333 (1844) non Linn. The specimen is a small scrap, but we believe our identification is correct. The exact locality where Sibthorp collected this plant is unknown, and in the Prodr. ii. 240 (1813) the name *Q. rigida* Willd. Sp. Pl. iv. 434 (1805) is used with a question mark. The locality given, "in littoribus Caramaniae," is simply taken from Willdenow.

2288. **Chrozophora obliqua** *A. Juss.* ex Spr. Syst. Veg. iii. 856 (1826) [var.] *α* **genuina** *Prain* in Kew Bull. 1918, 112. *C. verbascifolia* Juss. Tent. Euphorb. 28 (1824); Hal. Consp. Fl. Gr. iii. 93 (1904). *Croton villosum* S. et S. Prodr. ii. 249 (1813) et Fl. Gr. t. 951 (1840) non Forsk. "Circa Athenas."

2344. **Notholaena Marantae** *Desv.* Journ. Bot. appl. 1813, i. 92 (modo "*Maranthae*"); Hal. Consp. Fl. Gr. iii. 466 (1904). *Acrosticum Marantae* L. Sp. Pl. 1071 (1753); S. et S. Prodr. ii. 271 (1813) et Fl. Gr. t. 964 (1840). "In Cretâ et Cypro insulâ; etiam in monte Athô."

XIX.—ALPHABETICAL LIST OF NOMINA REJICIENDA (**Phanerogamae**).—T. A. Sprague and M. L. Green.

An alphabetical list of the generic names treated as "nomina conservanda" by the International Botanical Congresses at Vienna (1905) and Brussels (1910) appeared in Kew Bull. 1921, 321. A

ompanion list of "nomina rejicienda" is now given. The ejected names are printed in italics, and are followed by the orresponding conserved ones in roman type. A mark of nterrogation preceding a "nomen rejiciendum" indicates that here is some doubt as to whether it is synonymous with the "nomen onservandum" which follows.

Unlike the "nomina conservanda," which are retained unonditionally,* the "nomina rejicienda" are rejected merely ecause they are regarded as synonyms of conserved names. This, owever, may be in many cases a matter of opinion, while in ther cases the "nomina rejicienda" are certainly not synonymous vith the corresponding "nomina conservanda," *Behen* Hill, for xample, being a synonym of *Centaurea* not of *Vernonia*. The ystematic list of "nomina rejicienda" which appeared in the nternational Rules (ed. 2, Jena, 1912) was compiled in accordance vith the classification adopted in Dalla Torre et Harms, Genera iphonogamarum (1900–1907). If a genus included in the present ist is treated as being generically distinct from the corresponding 'nomen conservandum" its name automatically ceases to be a 'nomen rejiciendum" for those who accept that treatment. Thus hose who agree with Schindler† in treating *Meibomia* [Heist. ex] Adans. as generically distinct from *Desmodium* Desv. may adopt he name *Meibomia* under International Rules in spite of its being n the list of "nomina rejicienda".

In some cases "nomina rejicienda" are duplicates of accepted ames published by different authors for different groups. Thus he rejected name *Pavonia* Ruiz et Pav. (Monimiaceae) should ot be confused with *Pavonia* Cav. (Malvaceae), which is a conserved ame. Attention has been drawn in the List to accepted names vhich are duplicated by "nomina rejicienda."

Many of the "nomina rejicienda" are intrinsically invalid, and ence need not have been included in the International List, as as been pointed out in Journ. Bot. 1924, 143. *Gaguedi* Bruce, or example, was not published as a *generic* name: Bruce's account f this and other plants found by him in Abyssinia was given under heir *vernacular* names ; occasionally he added the scientific name, s in the case of "Farek or Bauhinia acuminata" and "Kuara," f which he remarked: "It is what they call a Corallodendron"; ut he did not give identifications of "Gaguedi", "Wanzey", 'Walkuffa", etc.

As there is some difference of opinion as to whether Cavolini's enus was "*Phucagrostis*" or "*Phucagrostis major*," both forms have een given. This case is discussed in Journ. Bot. 1924, 145.

Iriha Kuntze and *Uretia* Kuntze have been omitted from the ist, as they are merely modern variants of *Iria* and *Ouret* respecively, and have no claim whatever to recognition.

* At any rate so long as the generic concept is not enlarged so as to include ther genera.

† Fedde, Repert. xx. 136–155 (1924).

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A few corrections in citation have been made: in some cases, e.g. *Hypocistis*, an earlier reference for the "nomen rejiciendum" has been traced; in others, e.g. *Parapetalifera* Wendl., the date of publication given in the International List appears to be inaccurate.*

Abama Adans. (1763) : Narthecium *Juss.*
Abelicea Reichb. (1828) : Zelkova *Spach.*
Aberemoa Aubl. (1775) : Duguetia *A. St.-Hil.*
Abumon Adans. (1763) : Agapanthus *L'Hérit.*
Achyrodes Boehm. (1760) : Lamarckia *Moench.*
Acidoton P. Br. (1756), non Sw. (1788) : Securinega *Comm. ex Juss.*
?*Acouroa* Aubl. (1775) : Dalbergia *L. f.*
Acuan Medik. (1786) : Desmanthus *Willd.*
Acyntha Medik. (1786) : Sansevieria *Thunb.*
Adamaram Adans. (1763) : Terminalia *L.*
Adenostegia Benth. (1836) : Cordylanthus *Nutt. ex Benth.*
Adicea Rafin. (1815) : Pilea *Lindl.*
?*Adnaria* Rafin. (1817) : Gaylussacia *H. B. K.*
Adodendrum Neck. (1790) : Rhodothamnus *Reichb.*
Adolia Lam. (1783) : Scutia *Comm. ex Brongn.*
Adopogon Neck. (1790) : Krigia *Schreb.*
Aembilla Adans. (1763) : Scolopia *Schreb.*
Afzelia J. F. Gmel. (1791), non Smith (1798) : Seymeria *Pursh.*
Agallochum Lam. (1783) : Aquilaria *Lam.*
Agati Adans. (1763) : Sesbania *Scop.*
Agialid Adans. (1763) : Balanites *Delile.*
Ahouai Mill. (1754) ; Boehm. (1760) : Thevetia *Adans.*
Alacospermum Neck. (1790) : Cryptotaenia *DC.*
Alguelaguen Adans. (1763) : Sphacele *Benth.*
Alicastrum P. Br. (1756) ; Adans. (1763) : Brosimum *Sw.*
Alismorchis Thou. (1822) ; Calanthe *R. Br.*
Alismorkis Thou. (1809) : Calanthe *R. Br.*
Allodape Endl. (1839) : Lebetanthus *Endl.*
Alstonia Scop. (1777), non R. Br. (1809) : Landolphia *Beauv.*
Amaracus Hill (1756), non Glad. (1764) : Majorana *Boehm.*
Amberboi Adans. (1763) : Amberboa *Less.*
Amblostima Rafin. (1836) : Schoenolirion *Durand.*
Ambulia Lam. (1783) : Limnophila *R. Br.*
Amerimnon P. Br. (1756) : Dalbergia *L. f.*
Androphylax Wendl. (1798) : Cocculus *DC.*
Angolam Adans. (1763) : Alangium *Lam.*
Angolamia Scop. (1777) : Alangium *Lam.*
Anguillaria Gaertn. (1788), non R. Br. (1810) : Heberdenia *Banks ex A. DC.*
Anidrum Neck. (1790) : Bifora *Hoffm.*
Anneslia Salisb. (1807) : Calliandra *Benth.*
Apalatoa Aubl. (1775) : Crudia *Schreb.*
Aphora Neck. (1790) : Podalyria *Lam.*
Aphyllocaulon Lag. (1811) : Gerbera *Cass.*
Apinella Neck. (1790) : Trinia *Hoffm.*
Arduina Adans. (1763) : Kundmannia *Scop.*
Arduina [Mill. ex] L. (1767) : Carissa *L.*
Arkezostis Rafin. (1836) : Cayaponia *Silva Manso.*
Aroides [Heist. ex] Fabr. (1763) : Zantedeschia *Spreng.*
Aruana Burm. f. (1769) : Myristica [*L.*] *Rottb.*
Assonia Cav. (1786) : Dombeya *Cav.*

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* According to B. D. Jackson in Bull. Herb. Boiss. sér. 1, i. 297 (1893), the third part of Wendland's Collectio Plantarum, in which *Parapetalifera* appeared, was published in 1806, not 1808 as given in the systematic list.

Athalmum Neck. (1790) : Pallenis Cass.
?*Atitara* Marcgr. ex Juss. (1816) : Desmoncus *Mart.*
Atylus Salisb. (1807) p.p. : Isopogon *R. Br. ex Knight*
Augusta Leandro (1819), non Pohl (1831) : Stifftia *Mikan.*

Baeumerta Gaertn. Mey. et Scherb. (1800) : Nasturtium *R. Br.*
Bahel Adans. (1763) : Artanema *D. Don.*
Baitaria Ruiz et Pav. (1794) : Calandrinia *H. B. K.*
Balsamea Gled. (1782) : Commiphora *Jacq.*
Banksia Forst. (1776), non L. f. (1781) : Pimelea *Banks et Sol. ex Gaertn.*
Barraldeia Thou. (1806) : Carallia *Roxb. ex. R. Br.*
Baryxylum Lour. (1790) : Peltophorum *Walp.*
Basilaea Juss. ex Lam. (1783) : Eucomis *L'Hérit.*
Basilima Rafin. (1836) : Sorbaria *A. Br. ex Aschers.*
Basteria Mill. (1759) : Calycanthus *L.*
Batschia Vahl (1794) : Humboldtia *Vahl.*
Baumgartia Moench (1794) : Cocculus *DC.*
Baursea Hoffmgg. (1824) ; Reichb. (1828) : Philodendron *Schott.*
Behen Hill (1762), non Moench (1794) : Vernonia *Schreb.*
Belis Salisb. (1807) : Cunninghamia *R. Br.*
Belou Adans. (1763) : Aegle *Correa.*
Beluttakaka Adans. (1763) : Chonemorpha *G. Don.*
Belvala Adans. (1763) : Struthiola *L.*
Benjamina Vell. (1825) : Dictyoloma *DC. ex A. Juss.*
Benthamia Lindl. (1830), non Lindl. (1833) : Amsinckia *Lehm.*
Bergera Koenig ex L. (1771) : Murraya *Koenig ex L.*
Beureria Ehret (1755), non Jacq. (1760) : Calycanthus *L.*
Bichea Stokes (1812) : Cola *Schott et Endl.*
Bicuculla Borckh. (1797) : Adlumia *Rafin.*
Bihai Adans. (1763) : Heliconia *L.*
Bikukulla Adans. (1763) : Dicentra *Bernh.*
Billottia R. Br. (1832) : Agonis *Lindl.*
Bladhia Thunb. (1781) : Ardisia *Sw.*
Blatti Adans. (1763) : Sonneratia *L. f.*
Bolducia Neck. (1790) : Dipteryx *Schreb.*
Bolelia Rafin. (1832) : Downingia *Torr.*
Bonaveria Scop. (1777) : Securigera *DC.*
Boretta Neck. (1790) : Daboëcia *D. Don.*
Borraginoides Moench (1794) : Trichodesma *R. Br.*
Botor Adans. (1763) : Psophocarpus *Neck.*
Bradburya Rafin. (1817) : Centrosema *Benth.*
Braddleya Vell. (1825) : Amphirrhox *Spreng.*
Brami Adans. (1763) : Bacopa *Aubl.*
Brasiliastrum Lam. (1783) : Picramnia *Sw.*
Brucco Wendl. (1808) : Agathosma *Willd.*
Brucephalon L. (1753) : Trophis [*P. Br.*] *L.*
Bruda Adans. (1763) : Spergularia *J. et C. Presl.*
Bruinalis Rafin. (1836) : Siphonychia *Torr. et Gray.*
Brulbilis Rafin. (1819) : Buchloë *Engelm.*
Brurneya Cham. et Schlecht. (1829) : Timonius *DC.*
Brursa Weber ex Wiggers (1780) : Capsella *Medik.*
Brutneria Duhamel (1755) : Calycanthus *L.*

cactus L. (1753) : Mammillaria *Haw.*
cadelari Medik. (1787) : Pupalia *Juss.*
cajan Adans. (1763) : Cajanus *DC.*
cajuputi Adans. (1763) : Melaleuca *L.*
calanthera Nutt. ex Hook. (1856) : Buchloë *Engelm.*
calasias Rafin. (1836) : Anisotes *Nees.*
calceolaria Loefl. (1758), non L. (1771) : Hybanthus *Jacq.*

Caldasia Mutis ex Caldas (1810) : Helosis *L. C. Rich.*
Calesiam Adans. (1763) : Lannea *A. Rich.*
Callista Lour. (1790) : Dendrobium *Sw.*
Callistachys Vent. (1803) : Oxylobium *Andr.*
Callistemma Cass. (1817), non Boiss. (1875) : Callistephus *Cass.*
Callixene Comm. ex Juss. (1789) : Luzuriaga *Ruiz et Pav.*
Calorophus Labill. (1806) : Hypolaena *R. Br.*
Cammarum Hill (1756) : Eranthis *Salisb.*
Campulosus Desv. (1810) : Ctenium *Panz.*
Camunium Adans. (1763) : Murraya *Koenig ex L.*
Cananga Aubl. (1775), non Hook. f. et Thoms. (1855) : Guatteria *Ruiz et Pav.*
Canavali Adans. (1763) : Canavalia *DC.*
Candarum Reichb. ex Schott (1832) : Amorphophallus *Blume ex Decne.*
Cantuffa J. F. Gmel. (1791) : Pterolobium *R. Br.*
Caopia Adans. (1763) : Vismia *Vand.*
Capnoides Adans. (1763) : Corydalis *Medik.*
Capnorchis Borckh. (1797) : Dicentra *Bernh.*
Capnorea Rafin. (1836) : Hesperochiron *S. Wats.*
Capriola Adans. (1763) : Cynodon *L. C. Rich.*
Capura L. (1771), non Blanco (1837) : Wikstroemia *Endl.*
Carandas Adans. (1763) : Carissa *L.*
Carapichea Aubl. (1775) : Cephaëlis *Sw.*
Carara Thou. (1805), non Medik. (1792) : Pachyrrhizus *Rich.*
Carbenia Adans. (1763) : Cnicus *L. emend. Gaertn.*
Cardaminum Moench (1794) : Nasturtium *R. Br.*
Carelia Cav. (1802), non Less. (1832) : Mikania *Willd.*
Caspia Scop. (1777) : Vismia *Vand.*
Cassebeeria Dennst. (1818) : Sonerila *Roxb.*
Catevala Medik. (1786) : Haworthia *Duval.*
Cathea Salisb. (1812) : Calopogon *R. Br.*
Caulinia Moench (1802) : Kennedya *Vent.*
Cavanilla Thunb. (1792) : Pyrenacantha *Wight.*
Cebatha Forsk. (1775) : Cocculus *DC.*
Ceraia Lour. (1790) : Dendrobium *Sw.*
Ceranthus Schreb. (1789) : Linociera *Sw.*
Cervicina Del. (1813) : Wahlenbergia *Schrad.*
Chalcas L. (1767) : Murraya *Koenig ex L.*
Chamaecistus Oeder (1761) : Loiseleuria *Desv.*
Chasmone E. Mey. (1835) : Argyrolobium *Eckl. et Zeyh*
Chayota Jacq. (1780) : Sechium [*P. Br.*] *Juss.*
Chenocarpus Neck. (1790) : Borreria *G. F. W. Mey.*
Chesnea Scop. (1777) : Cephaëlis *Sw.*
Chlamydanthus C. A. Mey. (1843) : Thymelaea *Endl.*
Chlamysporum Salisb. (1808) : Thysanotus *R. Br.*
Chocho Adans. (1763) : Sechium [*P. Br.*] *Juss.*
Chrosperma Rafin. (1825) : Amianthium *A. Gray.*
Chryseis Cass. (1817) : Amberboa *Less.*
Chupalon Adans. (1763) : Cavendishia *Lindl.*
Chytraculia P. Br. (1756) : Calyptranthes *Sw.*
Chytralia Adans. (1763) : Calyptranthes *Sw.*
Cieca Adans. (1763) : Julocroton *Mart.*
Circinus Medik. (1789) : Hymenocarpus *Savi.*
Cisticapnos Adans. (1763) : Corydalis *Medik.*
Clavenna Neck. (1790) : Lucya *DC.*
Clementea Cav. (1804) : Canavalia *DC.*
Clompanus Aubl. (1775) : Lonchocarpus *H. B. K.*
Coccocipsilum [P. Br. ex] Boehm. (1760) : Coccocypselum *Schreb.*
Coccosipsilum Sw. (1788) : Coccocypselum *Schreb.*
Coilotapalus P. Br. (1756) : Cecropia *Loefl.*
Coleosanthus Cass. (1817) : Brickellia *Ell.*
Colinil Adans. (1763) : Tephrosia *Pers.*

Comacum Adans. (1763) : Myristica [*L.*] *Rottb.*
Compsoa D. Don (1825) : Tricyrtis *Wall.*
Condea Adans. (1763) : Hyptis *Jacq.*
Copaiva Jacq. (1760) : Copaifera *L.*
Cormigonus Rafin. (1820) : Bikkia *Reinw.*
Corycarpus Zea ex Spreng. (1825) : Diarrhena *Beauv.*
Cosmia Domb. ex Juss. (1789) : Calandrinia *H. B. K.*
Cosmiza Rafin. (1836) : Polypompholyx *Lehm.*
Coublandia Aubl. (1775) : Muellera *L.*
Coumarouna Aubl. (1775) : Dipteryx *Schreb.*
Covolia Neck. (1790) : Borreria *G. F. W. Mey.*
Cracca L. (1753), non Benth. (1853) : Tephrosia *Pers.*
Crantzia Scop. (1777), non Nutt. (1818) : Alloplectus *Mart.*
Cranzia Schreb. (1789) : Toddalia *Juss.*
Crassina Scepin (1758) : Zinnia *L.*
?*Crassocephalum* Moench (1794) : Gynura *Cass.*
Critamus Besser (1822) : Falcaria *Host.*
Crocodiloides Adans. (1763) : Berkheya *Ehrh.*
Cruzeta Loefl. (1758) : Iresine [*P. Br.*] *L.*
Cucullaria Schreb. (1789) : Vochysia *Juss.*
Cumbia Buch.-Ham. (1807) : Careya *Roxb.*
Cunto Adans. (1763) : Acronychia *Forst.*
Cussambium Lam. (1786) : Schleichera *Willd.*
Cyanotris Rafin. (1818) : Camassia *Lindl.*
Cybele Salisb. (1809) : Stenocarpus *R. Br.*
Cylizoma Neck. (1790) : Derris *Lour.*
Cysticapnos [Boerh.] Gaertn. (1791) : Corydalis *Medik.*

Dactilon Vill. (1787) : Cynodon *L. C. Rich.*
Dactylicapnos Wall. (1826) : Dicentra *Bernh.*
Damapana Adans. (1763) : Smithia *Ait.*
Dammara Lam. (1786) : Agathis *Salisb.*
Daun-contu Adans. (1763) : Paederia *L.*
Deguelia Aubl. (1775) : Derris *Lour.*
Dendrorchis Thou. (1822) : Polystachya *Hook.*
Dendrorkis Thou. (1809) : Polystachya *Hook.*
Denisaea Neck. (1790) : Bouchea *Cham.*
Deprea Rafin. (1838) : Athenaea *Sendtn.*
Deringa Adans. (1763) : Cryptotaenia *DC.*
Detris Adans. (1763) : Felicia *Cass.*
Diapedium Koenig (1805) : Dicliptera *Juss.*
Diarina Rafin. (1808) : Diarrhena *Beauv.*
Diatoma Lour. (1790) : Carallia *Roxb. ex R. Br.*
Diceros Lour. (1790) : Limnophila *R. Br.*
Diclytra Borckh. (1797) : Dicentra *Bernh.*
Dielytra Cham. et Schlecht. (1826) : Dicentra *Bernh.*
Dipetalia Rafin. (1836) : Oligomeris *Cambess.*
Diphaca Lour. (1790) : Ormocarpum *Beauv.*
Diphryllum Rafin. (1808) : Listera *R. Br.*
Diplachne R. Br. ex Desf. (1819), non Beauv. (1812) : Verticordia *DC.*
Diplodium Sw. (1810) : Pterostylis *R. Br.*
Diplogon Rafin. (1818) : Chrysopsis *Ell.*
Diplonyx Rafin. (1808) : Wistaria *Nutt.*
Diplukion Rafin. (1838) : Iochroma *Benth.*
Disarrenum Labill. (1806) : Hierochloë *R. Br.*
Dolicholus Medik. (1787) : Rhynchosia *Lour.*
Dombeya L'Hérit. (1784), non Cav. (1786) : Tourrettia *Fouger.*
Dondia Adans. (1763) : Suaeda *Forsk.*
Donia G. et D. Don (1832) : Clianthus *Banks et Sol.*
Dunalia Spreng. (1815), non H. B. K. (1818) : Lucya *DC.*

Dupatya Vell. (1825) : Paepalanthus *Mart.*
Dupinia Scop. (1777) : Ternstroemia *Mutis ex L. f.*

Ecastaphyllum P. Br. (1756) : Dalbergia *L. f.*
Edwardia Rafin. (1814) : Cola *Schott et Endl.*
Elaphrium Jacq. (1760) : Bursera *Jacq. ex L.*
Elaterium Boehm.(1760) ; Adans. (1763) ; Moench (1794), non Jacq. (1763) : Ecballium *A. Rich.*
Elephas Boehm. (1760) ; Adans. (1763) : Rhynchocorys *Griseb.*
Ellimia Nutt. ex Torr. et Gray (1838) : Oligomeris *Cambess.*
Elytrospermum C. A. Mey. (1831) : Schoenoplectus *Palla.*
Enargea Banks ex Gaertn. (1788) : Luzuriaga *Ruiz et Pav.*
Ephynes Rafin. (1838) : Monochaetum *Naud.*
Epibaterium Forst. (1776) : Cocculus *DC.*
Epidorchis Thou. (1822) : Oeonia *Lindl.*
Epidorkis Thou. (1809) : Oeonia *Lindl.*
Erodendrum Salisb. (1807) : Protea *R. Br.*
Erporchis Thou. (1822) : Platylepis *A. Rich.*
Erporkis Thou. (1809) : Platylepis *A. Rich.*
Espera Willd. (1801) : Berrya *Roxb.*
Ethesia Rafin. (1836) : Jacobinia *Moric.*
Euosma Andr. (1808) : Logania *R. Br.*
Eupatoriophalacron Adans. (1763) : Eclipta *L.*
Evea Aubl. (1775) : Cephaëlis *Sw.*

Fabricia Scop. (1777) : Alysicarpus Neck.
Falcata J. F. Gmel. (1791) : Amphicarpaea *Ell.*
Farnesia [Heist. ex] Fabr. (1763) : Persea *Gaertn. f.*
Fedia Adans. (1763), non Moench (1794) : Patrinia *Juss.*
Fibichia Koel. (1802) : Cynodon *L. C. Rich.*
Flavicoma Rafin. (1836) : Schaueria *Nees.*
Freyeria Scop. (1777) : Linociera *Sw.*
Funckia Willd. (1808) : Astelia *Banks. et Sol. ex R. Br.*
Furera Adans. (1763) : Pycnanthemum *L. C. Rich.*

Gaertneria Medik. (1789) : Franseria *Cav.*
Galatea Salisb. (1812) : Eleutherine *Herb.*
Galedupa Lam. (1786) : Pongamia *Vent.*
Gansblum Adans. (1763) : Erophila *DC.*
Gastrilia Rafin. (1836) : Thymelaea *Endl.*
Gastrochilus D. Don (1825), non Wall. (1830) : Saccolabium *Blume.*
Geboscon Rafin. (1824) : Nothoscordum *Kunth.*
Gemmingia [Heist. ex] Fabr. (1763) : Belamcanda *Adans.*
Genosiris Labill. (1804) : Patersonia *R. Br.*
Germanea Lam. (1788) : Plectranthus *L'Hérit.*
Ghesaembilla Adans. (1763) : Embelia *Burm. f.*
Gigalobium P. Br. (1756) ; Boehm. (1760) : Entada *Adans.*
Glabraria L. (1771) : Litsea *Lam.*
Glandulifera " Wendl. " ex Dalla Torre et Harms (1901) : Adenandra *Willd.*
Glandulifolia Wendl. (1808) : Adenandra *Willd*
Globifera J. F. Gmel. (1791) : Micranthemum *L. C Rich.*
Glycycarpus Dalz. (1849) : Nothopegia *Blume.*
Gomozia Mutis ex L. f. (1781) : Nertera *Banks et Sol. ex Gaertn.*
Gothofreda Vent. (1803) : Oxypetalum *R. Br.*
Graphorchis Thou. (1822) : Eulophia *R. Br.*
Graphorkis Thou. (1809) : Eulophia *R. Br.*
Gruhlmania Neck. (1790) : Borreria *G. F. W. Mey.*
Guidonia P. Br. (1756) : Laetia *Loefl.*
Gynampsis Rafin. (1836) : Downingia *Torr.*

Gynopogon Forst. (1776) : Alyxia *Banks ex R. Br.*
Gyrostachis Pers. (1807) : Spiranthes *L. C. Rich.*
Gyrotheca Salisb. (1812) : Lachnanthes *Ell.*

Haberlia Dennst. (1818) : Lannea *A. Rich.*
Hadestaphylum Dennst. (1818) : Holigarna *Buch.-Ham. ex Roxb.*
Haenkea F. W. Schmidt (1793) : Adenandra *Willd.*
Halesia Loefl. (1758), non L. (1759) : Trichilia [*P. Br.*] *L.*
Hariota Adans. (1763), non DC. (1834) : Rhipsalis *Gaertn.*
Hartogia L. (1759), non L. f. (1781) : Agathosma *Willd.*
Hecaste Sol. ex Schum. (1793) : Bobartia *Salisb.*
Hedusa Rafin. (1838) : Dissotis *Benth.*
Hedypnois Scop. (1772), non Schreb. (1791) : Taraxacum *Wiggers.*
Heinzia Scop. (1777) : Dipteryx *Schreb.*
Heleophylax Beauv. (1819) : Schoenoplectus *Palla.*
Helleboroides Adans. (1763) : Eranthis *Salisb.*
Helospora Jack (1823) : Timonius *DC.*
Helxine L. (1753) p.p., non Req. (1825) : Fagopyrum *Moench.*
Hemieva Rafin. (1836) : Suksdorfia *A. Gray.*
Hepetis Sw. (1788) : Pitcairnia *L'Hérit.*
Heritiera J. F. Gmel. (1791), non Ait. (1789) : Lachnanthes *Ell.*
Hermesias Loefl. (1758) : Brownea *Jacq.*
Hermupoa Loefl. (1758) : Steriphoma *Spreng.*
Heteranthus Borkh. (1796) : Ventenata *Koel.*
Heteromorpha Cass. (1817), non Cham. et Schlecht. (1826) : Heterolepis *Cass.*
Hexalepis Rafin. (1836) : Vriesia *Lindl.*
Hexastylis Rafin. (1836) : Caylusea *A. St.-Hil.*
Heydia Dennst. (1818) : Scleropyrum *Arn.*
Hicoria Rafin. (1838) : Carya *Nutt.*
Hicorius Rafin. (1817) : Carya *Nutt.*
Hierochontis Medik. (1792) : Euclidium *R. Br.*
Hippion Spreng. (1825) : Enicostemma *Blume.*
Hoelzelia Neck. (1790) : Swartzia *Schreb.*
Hoferia Scop. (1777) : Ternstroemia *Mutis ex L. f.*
Hofmannia [Heist. ex] Fabr. (1759) : Amaracus *Gleditsch.*
Hoiriri Adans. (1763) : Aechmea *Ruiz et Pav.*
Homaid Adans. (1763) : Biarum *Schott.*
Homalocenchrus Mieg (1760) : Leersia *Sw.*
Hondbessen Adans. (1763) : Paederia *L.*
Hookera Salisb. (1808) : Brodiaea *Sm.*
Hoorebeckia Cornelissen (1817) : Haplopappus *Cass.*
Hugueninia Reichb. (1832) : Descurainia *Webb. et Berth.*
Humboldtia Ruiz et Pav. (1794), non Vahl (1794) : Stelis *Sw.*
Hurtum Adans. (1763) : Barringtonia *Forst.*
Hydropityon Gaertn. f. (1805) : Limnophila *R. Br.*
Hylogyne Salisb. (1809) : Telopea *R. Br.*
Hymenochaeta Beauv. (1819) : Schoenoplectus *Palla.*
Hypaelyptum Vahl (1806) : Lipocarpha *R. Br.*
Hypocistis Boehm. (1760) : Adans. (1763) : Cytinus *L.*
Hypolepis Beauv. (1819) : Ficinia *Schrad.*

Ibidium Salisb. (1812) : Spiranthes *L. C. Rich.*
Icacorea Aubl. (1775) : Ardisia *Sw.*
Ichthyomethia P. Br. (1756) : Piscidia *L.*
Ilicioides Dum.-Courset (1802) : Nemopanthus *Rafin.*
Ilmu Adans. (1763) : Romulea *Maratti.*
Imhofia Heist. (1753) : Nerine *Herb.*
Ioxylon Rafin. (1817) : Maclura *Nutt.*

Ipo Pers. (1807) : Antiaris *Leschen.*
Iria [L. C. Rich. (1805), subgen.] Hedw. f. (1806) : Fimbristylis *Vahl.*
Iridorchis Thou. (1822) : Oberonia *Lindl.*
Iridorkis Thou. (1809) : Oberonia *Lindl.*
Isopteris Wall. (1832) : Trigoniastrum *Miq.*

Jabotapita Adans. (1763) : Ouratea *Aubl.*
Jambolana Adans. (1763) : Acronychia *Forst.*
Jambos Adans. (1763) : Jambosa *DC.*
Japarandiba Adans. (1763) : Gustavia *L.*
Josephia Salisb. (1809), non Wight (1851) : Dryandra *R. Br.*
Juncoides Adans. (1763) : Luzula *DC.*

Kara-Angolam Adans. (1763) : Alangium *Lam.*
Karekandel Adans. (1763) : Carallia *Roxb. ex R. Br.*
Katoutheka Adans. (1763) : Ardisia *Sw.*
Katoutsjeroe Adans. (1763) : Holigarna *Buch.-Ham. ex Roxb.*
Koellia Moench (1794) : Pycnanthemum *L. C. Rich.*
Kokera Adans. (1763) : Chamissoa *H. B. K.*
Konig Adans. (1763) : Lobularia *Desv.*
Koon Gaertn. (1791) : Schleichera *Willd.*
Korycarpus Zea (1806) : Diarrhena *Beauv.*
Kraunhia Rafin. (1808) : Wistaria *Nutt.*
Kruegeria Scop. (1777) : Macrolobium *Schreb.*
Kuhnistera Lam. (1789) : Petalostemon *Michx.*
?*Kukolis* Rafin. (1838) : Hebecladus *Miers.*

Lacellia Viv. (1824) : Amberboa *Less.*
Lacinaria Hill (1762) : Liatris *Schreb.*
Laciniaria Hill (1768) : Liatris *Schreb.*
Laothoë Rafin. (1836) : Chlorogalum *Kunth.*
Lasianthus Adans. (1763), non Jack (1823) : Gordonia *Ellis.*
Lasiostega Rupr. ex Benth. (1857) : Buchloë *Engelm.*
Lass Adans. (1763) : Pavonia *Cav.*
Leaeba Forsk. (1775) : Cocculus *DC.*
Leonicenia Scop. (1777) : Miconia *Ruiz et Pav.*
Leontopetaloides Boehm. (1760) : Tacca *Forst.*
Lepargyrea Rafin. (1818) : Shepherdia *Nutt.*
Leperiza Herb. (1821) : Urceolina *Reichb.*
Lepia Hill (1759) : Zinnia *L.*
Lepidanthus Nees (1830) : Hypodiscus *Nees.*
Lepidocarpus Adans. (1763) : Protea *R. Br.*
Leptamnium Rafin. (1818) : Epiphegus (Epifagus) *Nutt.*
Leptaxis Rafin. (1836) : Tolmiea *Torr. et Gray.*
Leptorchis Thou. (1822) : Liparis *L. C. Rich.*
Leptorkis Thou. (1809) : Liparis *L. C. Rich.*
Lerchea Rueling (1774), non L. (1771) : Suaeda *Forsk.*
Leucadendron L. (1753) p.p., non Berg. (1810) : Leucospermum *R. Br.*
Leucadendron L. (1753) p.p., non Berg. (1810) : Protea *R. Br.*
Leucadendrum Salisb. (1807) : Leucospermum *R. Br.*
Lieutautia Buchoz (1779) : Miconia *Ruiz et Pav.*
Ligia Fasano (1788) : Thymelaea *Endl.*
Linkia Cav. (1797) : Persoonia *Sm.*
Lloydia (" *Lioydia* ") Neck. (1790), non Salisb. (1812) : Printzia *Cass.*
Lobelia Adans. (1763), non L. (1753) : Scaevola *L.*
Locandi Adans. (1763) : Samadera *Gaertn.*
Lophia Desv. (1825) : Alloplectus *Mart.*
Lotophyllus Link (1831) : Argyrolobium *Eckl. et Zeyh.*
Lunanea DC. (1825) : Cola *Schott et Endl.*
Lupsia Neck. (1790) : Galactites *Moench.*

Lussa Rumph. (1755) : Brucea *J. F. Mill.*
Lygistum [P. Br. ex] Boehm. (1760) : Manettia *Mutis ex L. f.*
Lysias Salisb. (1812) : Platanthera *L. C. Rich.*

Macaglia Rich. ex Vahl (1810) : Aspidosperma *Mart. et Zucc.*
Macrocalyx Trew (1761), non Costant. et Poiss. (1908) : Ellisia *L.*
Malache B. Vogel (1772) : Pavonia *Cav.*
Malacochaete Nees (1834) : Schoenoplectus *Palla.*
Malapoenna Adans. (1763) : Litsea *Lam.*
Malnaregam Adans. (1763) : Atalantia *Correa.*
Malveopsis C. Presl (1844) : Malvastrum *A. Gray.*
Mamboga Blanco (1837) : Mitragyna *Korth.*
Manisuris L. (1771), non Sw. (1788) : Rottboellia *L. f.*
Marcorella Neck. (1790) : Colubrina *L. C. Rich. ex Brongn.*
Mariana Hill (1762) : Silybum *Adans.*
Marsypocarpus Neck. (1790) : Capsella *Medik.*
Mauhlia Dahl (1787) : Agapanthus *L'Hérit.*
Maximiliana (" *Maximilianea* ") Mart. (1819), non Mart. (1824) : Cochlospermum *Kunth.*
Mayepea Aubl. (1775) : Linociera *Sw.*
Megotigea Rafin. (1836) : Helicodiceros *Schott.*
Meibomia Adans. (1763) : Desmodium *Desv.*
Melancranis Vahl (1806) : Ficinia *Schrad.*
Meriana Trew (1754) : Watsonia *Mill.*
Meridiana Hill (1761) : Gazania *Gaertn.*
Mesosphaerum P. Br. (1756) : Hyptis *Jacq.*
Micrampelis Rafin. (1808) : Echinocystis *Torr. et Gray.*
Micranthus Wendl. (1798), non Eckl. (1827) : Phaulopsis *Willd.*
Mitrophora Neck. (1790) : Fedia *Moench.*
Moehnia Neck. (1790) : Gazania *Gaertn.*
Mokof Adans. (1763) : Ternstroemia *Mutis ex L. f.*
Moniera [P. Br. ex] Adans. (1763) : Bacopa *Aubl.*
Moufetta Neck. (1790) : Patrinia *Juss.*
Myroxylon Forst. (1776), non L. f. (1781) : Xylosma *Forst.*
Myrstiphyllum P. Br. (1756) : Psychotria *L.*
Mystacinus Rafin. (1838) : Helinus *E. Mey. ex Endl.*

Nageia Gaertn. (1788) : Podocarpus *L'Hérit. ex Pers. emend. L. C. Rich.*
Nama L. (1753), non L. (1759) : Hydrolea *L.*
Nani Adans. (1763) : Metrosideros *Banks ex Gaertn.*
Nazia Adans. (1763) : Tragus [*Hall.*] *Scop.*
Neckeria Scop. (1777) : Corydalis *Medik.*
Needhamia Scop. (1777), non R. Br. (1810) : Tephrosia *Pers.*
Nelanaregam Adans. (1763) : Naregamia *Wight et Arn.*
Nelitris Gaertn. (1788) : Timonius *DC.*
Nemia Berg. (1767) : Manulea *L.*
Nephroia Lour. (1790) : Cocculus *DC.*
Nestronia Rafin. (1836) : Buckleya *Torr.*
Nidus Riv. (1760) : Neottia *Sw.*
Nocca Cav. (1794) : Lagascea *Cav.*
Nunnezharia Ruiz et Pav. (1794) : Chamaedorea *Willd.*

Odina Roxb. (1832) : Lannea *A. Rich.*
Odostemon Rafin. (1817) : Mahonia *Nutt.*
Omphalandria P. Br. (1756) : Omphalea *L.*
Opa Lour. (1790) : Rhaphiolepis *Lindl.*
Opulaster Medik. (1799) : Physocarpus *Maxim.*
Osterdamia Neck. (1790) : Zoysia *Willd.*
Ouret Adans. (1763) : Aerva *Forsk.*

Ourouparia Aubl. (1775) : Uncaria *Schreb.*
Outea Aubl. (1775) : Macrolobium *Schreb.*
Oxytria Rafin. (1836) : Schoenolirion *Durand.*

Pacouria Aubl. (1775) : Landolphia *Beauv.*
Pagapate Sonner. (1776) : Sonneratia *L. f.*
Pallasia Houtt. (1775), non Klotzsch (1853) : Calodendrum *Thunb.*
Pallasia Scop. (1777), non Klotzsch (1853) : Crypsis *Ait.*
Palmafilix Adans. (1763) : Zamia *L.*
Palmstruckia Retz. f. (1810), non Sond. (1859) : Chaenostoma *Benth.*
Panel Adans. (1763) : Terminalia *L.*
Panicastrella Moench (1794) : Echinaria *Desf.*
Panicularia [Heist. ex] Fabr. (1763) : Glyceria *R. Br.*
Parapetalifera Wendl. (1806) : Barosma *Willd.*
Parasia Rafin. (1836) : Belmontia *E. Mey.*
Patagonium Schrank (1808) : Adesmia *DC.*
Patrisia L. C. Rich. (1792) : Ryania *Vahl.*
Pattara Adans. (1763) : Embelia *Burm. f.*
Pausia Rafin. (1836) : Thymelaea *Endl.*
Pavonia Ruiz et Pav. (1794), non Cav. (1786) : Laurelia *Juss.*
Peckia Vell. (1825) : Cybianthus *Mart.*
Pedicellaria Schrank (1790) : Gynandropsis *DC.*
Pelae Adans. (1763) : Xanthophyllum *Roxb.*
Peltimela Rafin. (1833) : Glossostigma *Wight et Arn.*
Pentagonia [Heist ex] Fabr. (1759), non Benth. (1844) : Nicandra *Adans.*
Periloba Rafin. (1836) : Nothoscordum *Kunth.*
Petesioides Jacq. (1763) : Wallenia *Sw.*
Phalangium Boehm. (1760) : Bulbine *Willd.*
Phrynium Loefl. (1758), non Willd. (1797) : Heteranthera *Ruiz et Pav.*
Phucagrostis Cavolini (1792) p.p. : Cymodocea *Koenig.*
Phucagrostis major Cavolini (1792) : Cymodocea *Koenig.*
Phyllaurea Lour. (1790) : Codiaeum *A. Juss.*
Phyllodes Lour. (1790) : Phrynium *Willd.*
Phyllorchis Thou. (1822) : Bulbophyllum *Thou.*
Phyllorkis Thou. (1809) : Bulbophyllum *Thou.*
Physalodes Boehm. (1760) : Nicandra *Adans.*
Physaloides Moench (1794) : Withania *Pauquy.*
Physocarpa Rafin. (1836) : Physocarpus *Maxim.*
Phytoxis Molina (1810) : Sphacele *Benth.*
Piaropus Rafin. (1836) : Eichhornia *Kunth.*
Pinalia Buch.-Ham. ex D. Don (1825) : Eria *Lindl.*
Piptochlamys C. A. Mey. (1843) : Thymelaea *Endl.*
Piratinera Aubl. (1775) : Brosimum *Sw.*
Piscipula Loefl. (1758) : Piscidia *L.*
Placus Lour. (1790) : Blumea *DC.*
Plaso Adans. (1763) : Butea *Koenig ex Roxb.*
Platylepis Kunth (1837), non A. Rich. (1828) : Ascolepis *Nees.*
Pleuranthe Salisb. (1809) : Protea *R. Br.*
Pleurolobus J. St.-Hil. (1812) : Desmodium *Desv.*
Pneumaria Hill (1764) : Mertensia *Roth.*
Podocarpus Labill. (1806), non L'Hérit. (1807), emend. L. C. Rich. (1826) : Phyllocladus *L. C. Rich.*
Pogomesia Rafin. (1836) : Tinantia *Scheidw.*
Polia Lour. (1790) : Polycarpaea *Lam.*
Pollichia Medik. (1783), non Ait. (1789) : Trichodesma *R. Br.*
Polygonastrum Moench (1794) : Smilacina *Desf.*
Polyphragmon Desf. (1820) : Timonius *DC.*
Pongati Adans. (1756) : Sphenoclea *Gaertn.*
Pongelion Adans. (1763) : Ailanthus *Desf.*
Porocarpus Gaertn. (1791) : Timonius *DC.*

Possira Aubl. (1775) : Swartzia *Schreb.*
Prestonia Scop. (1777), non R. Br. (1809) : Pavonia *Cav.*
Prionitis Adans. (1763) : Falcaria *Host.*
Probosciphora Neck. (1790) : Rhynchocorys *Griseb.*
Protea L. (1753), non R. Br. (1810) : Leucadendron *Berg. emend. R. Br.*
Psedera Neck. (1790) : Parthenocissus *Planch.*
?*Pseudobrasilium* Adans. (1763) : Picramnia *Sw.*
Pseudofumaria Medik. (1789) : Corydalis *Medik.*
Pseudoscordum Herb. (1837) : Nothoscordum *Kunth.*
Psilosanthus Neck. (1790) : Liatris *Schreb.*
Psychotrophum P. Br. (1756) : Psychotria *L.*
Pterolepis Schrad. (1821), non Miq. (1840) : Schoenoplectus *Palla.*
Pterophorus Boehm. (1760) : Pteronia *L.*
Ptiloria Rafin. (1832) : Stephanomeria *Nutt.*
Ptyxostoma Vahl (1810) : Lonchostoma *Wikstr.*
Pubeta L. (1775) : Duroia *L. f.*
Pubilaria Rafin. (1836) : Simethis *Kunth.*
Pupal Adans. (1763) : Pupalia *Juss.*

Quamasia Rafin. (1818) : Camassia *Lindl.*
Quinaria Rafin. (1830) : Parthenocissus *Planch.*
Quirivelia Poir. (1804) : Ichnocarpus *R. Br.*

Razoumowskia Hoffm. (1808) : Arceuthobium *Bieb.*
Renealmia Houtt. (1777), non L. f. (1781) : Villarsia *Vent.*
Richaeia Thou. (1806) : Weihea *Spreng.*
Richardia Kunth (1818) : Zantedeschia *Spreng.*
Ridan Adans. (1763) : Actinomeris *Nutt.*
?*Robertia* Scop. (1777) : Bumelia *Sw.*
Robina Aubl. (1775) : Lonchocarpus *H. B. K.*
Roettlera Vahl (1805) : Didymocarpus *Wall.*
Rymandra Salisb. (1809) : Knightia *R. Br.*

Saguerus Adans. (1763) : Arenga *Labill.*
Salgada Blanco (1845) : Eusideroxylon *Teysm. et Binn.*
Salken Adans. (1763) : Derris *Lour.*
Salmonia Scop. (1777) : Vochysia *Juss.*
Sanamunda Adans. (1763) : Thymelaea *Endl.*
Sanseviella Reichb. (1828) : Reineckia *Kunth.*
Saussurea Salisb. (1807), non DC. (1810) : Hosta *Tratt.*
Savastana Schrank (1789) : Heirochloë *R. Br.*
Savia Rafin. (1808), non Willd. (1806) : Amphicarpaea *Ell.*
Scalia Sims (1806) : Podolepis *Labill.*
Scandalida Adans. (1763) : Tetragonolobus *Scop.*
Schizonotus Lindl. (1830), non A. Gray (1876) : Sorbaria *A. Br. ex Aschers.*
Schizonotus Rafin. (1836), non A. Gray (1876) : Holodiscus *Maxim.*
Schmidtia Tratt. (1811), non Steud. (1852) : Coleanthus *Seidel.*
Schoenodum Labill. (1806) : Lyginia *R. Br.*
Scoria Rafin. (1808) : Carya *Nutt.*
Securidaca Mill. (1754), non L. (1753) : Securigera *DC.*
Securina Medik. (1787) : Securigera *DC.*
Senites Adans. (1763) : Zeugites [*P. Br.*] *Schreb.*
Sesban Adans. (1763) : Sesbania *Scop.*
Sherardia Adans. (1763), non L. (1753) : Stachytarpheta *Vahl.*
Sicelium [P. Br. ex] Boehm. (1760) ; Adans. (1763) : Coccocypselum [*Sw. in*] *Schreb.*
Simbuleta Forsk. (1775) : Anarrhimum *Desf.*
Sitilias Rafin. (1836) : Pyrrhopappus *DC.*
Skimmi Adans. (1763) : Skimmia *Thunb.*
Solori Adans. (1763) : Derris *Lour.*

Sophia Adans. (1763) : Descurainia *Webb. et Berth.*
Soranthe Salisb. (1809) : Sorocephalus *R. Br.*
Soria Adans. (1763) : Euclidium *R. Br.*
Sparmannia Buchoz (1779), non L. f. (1781) : Rehmannia *Libosch. ex Fisch. et Mey.*
Spathe [P. Br. ex] Boehm. (1760) : Spathelia *L.*
Spathularia A. St.-Hil. (1824), non Pers. (1797) : Amphirrhox *Spreng.*
Spathyema Rafin. (1808) : Symplocarpus *Salisb.*
Spermacoce Adans. (1763), non L. emend. Gaertn. (1788) : Borreria *G. F. W. Mey.*
Spermophylla Neck. (1790) : Ursinia *Gaertn.*
Spiesia Neck. (1790) : Oxytropis *DC.*
Steinhauera Presl (1838) : Sequoia *Endl.*
Stellorchis Thou. (1822) : Nervilia *Comm. ex Gaudich.*
Stellorkis Thou. (1809) : Nervilia *Comm. ex Gaudich.*
Stemodiacra P. Br. (1756) : Stemodia *L.*
Stickmannia Neck. (1790) : Dichorisandra *Mikan.*
Stizolobium P. Br. (1756) : Mucuna *Adans.*
Stylexia Rafin. (1836) : Caylusea *A. St.-Hil.*
Syama Jones (1795) : Pupalia *Juss.*

Taligalea Aubl. (1775) : Amasonia *L. f.*
Tamonea Aubl. Hist. i. 440 (1775), non l.c. 659 : Miconia *Ruiz et Pav.*
Taonabo Aubl. (1775) : Ternstroemia *Mutis ex L. f.*
Tapogomea Aubl. (1775) : Cephaëlis *Sw.*
Taralea Aubl. (1775) : Dipteryx *Schreb.*
Tardavel Adans. (1763) : Borreria *G. F. W. Mey.*
Tariri Aubl. (1775) : Picramnia *Sw.*
Tekel Adans. (1763) : Libertia *Spreng.*
Tephrothamnus Sweet (1830) : Argyrolobium *Eckl. et Zeyh.*
Terminalis Rumph. (1755) : Cordyline *Comm. ex Juss.*
Tetragonanthus S. G. Gmel. (1769) : Halenia *Borkh.*
Thamnia P. Br. (1756) : Laetia *Loefl.*
Theka Adans. (1763) : Tectona *L.*
Theodora Medik. (1786) : Schotia *Jacq.*
Thouinia L. f. (1781), non Poit. (1804) : Linociera *Sw.*
Thyrsanthemo Neck. (1790) : Chaptalia *Vent.*
Thyrsanthus Ell. (1818) : Wistaria *Nutt.*
Tingulonga [" *Tingulong* "] Rumph. (1755) : Protium *Burm. f.*
Tissa Adans. (1763) : Spergularia *J. et C. Presl.*
Toluifera L. (1753) : Myroxylon *L. f.*
Tomex Thunb. (1783) : Litsea *Lam.*
Tonningia Neck. (1790) : Cyanotis *D. Don.*
Tontanea Aubl. (1775) : Coccocypselum *Schreb.*
Torresia Ruiz et Pav. (1794) : Hierochloë *R. Br.*
Touchiroa Aubl. (1775) : Crudia *Schreb.*
Toulichiba Adans. (1763) : Ormosia *Jack.*
Toumboa Naud. (1862) : Welwitschia *Hook. f.*
Tounatea Aubl. (1775) : Swartzia *Schreb.*
Tournesol Adans. (1763) : Chrozophora *Neck.*
Tournesolia Scop. (1777) : Chrozophora *Neck.*
Tovaria Neck. (1790), non Ruiz et Pav. (1794) : Smilacina *Desf.*
Toxylon Rafin. (1819) : Maclura *Nutt.*
Tricondylus Salisb. (1809) : Lomatia *R. Br.*
Triodon L. C. Rich. (1805) : Rhynchospora *Vahl.*
Tripinna Lour. (1790) : Colea *Boj.*
Tripinnaria Pers. (1807) : Colea *Boj.*
Trochera L. C. Rich. (1779) : Ehrharta *Thunb.*
Tsjerucaniram Adans. (1763) : Cansjera *Juss.*
Tubanthera Comm. ex DC. (1825) : Colubrina *L. C. Rich. ex Brongn.*

Tubiflora J. F. Gmel. (1791) : Elytraria *L. C. Rich.*
Tubutubu Rumph. (1755) : Tapeinocheilos *Miq.*
Tulbaghia Heist. (1753), non L. (1771) : Agapanthus *L'Hérit.*
Tumboa Welw. (1861) : Welwitschia *Hook. f.*

Uloma Rafin. (1836) : Colea *Boj.*
Ulticona Rafin. (1838) : Hebecladus *Miers.*
Unifolium Boehm. (1760) ; Adans. (1763) : Maianthemum *Web.*
Urceolaria Herb. (1821) : Urceolina *Reichb.*
Urceolaria Willd. (1790) : Schradera *Vahl.*
Urticastrum Fabr. (1759) : Laportea *Gaudich.*

Vagnera Adans. (1763) : Smilacina *Desf.*
Vahea Lam. (1792, tabula ; 1819, textus) : Landolphia *Beauv.*
Valentinia [Heist. ex] Fabr. (1763) : Maianthemum *Web.*
Valeranda Neck. (1790) : Orphium *E. Mey.*
Valerianoides Medik. (1789) : Stachytarpheta *Vahl.*
Valteta Rafin. (1838) : Iochroma *Benth.*
?*Vedela* Adans. (1763) : Ardisia *Sw.*
Velaga Adans. (1763) : Pterospermum *Schreb.*
Verlangia Neck. (1790) : Argania *Roem. et Schult.*
Vermicularia Moench (1802) : Stachytarpheta *Vahl.*
Vexillaria Hoffmgg. (1824) : Centrosema *Benth.*
Vibo Medik. (1789) : Emex *Neck.*
Viborquia Ortega (1798) : Eysenhardtia *H. B. K.*
?*Vionaea* Neck. (1790) : Protea *R. Br.*
Vireya Rafin. (1814) : Alloplectus *Mart.*
Vochy Aubl. (1775) : Vochysia *Juss.*
Vochya Vell. ex Vand. (1788) : Vochysia *Juss.*
Volutarella Cass. (1826) : Amberboa *Less.*
Volutaria Cass. (1816) : Amberboa *Less.*
Volvulus Medik. (1791) : Calystegia *R. Br.*
Vouacapoua Aubl. (1775) : Andira *Lam.*
Vouapa Aubl. (1775) : Macrolobium *Schreb.*

Waldschmidtia Scop. (1777) : Crudia *Schreb.*
Wedelia Loefl. (1758), non Jacq. (1760) : Allionia *L. emend Choisy.*
Weingaertneria Bernh. (1800) : Corynephorus *Beauv.*
Wendlandia Willd. (1799), non Bartl. (1830) : Cocculus *DC.*
Werrinuwa Heyne (1814) : Guizotia *Cass.*
Wigandia Neck. (1790), non H.B.K. (1818) : Disparago *Gaertn.*
Wilckia Scop. (1777) : Malcolmia *R. Br.*
Willugbaeya Neck. (1790) : Mikania *Willd.*
Windmannia P. Br. (1756) ; Adans. (1763) : Weinmannia *L.*
Winterana L. (1759) : Canella [*P. Br.*] *Sw.*
Wittea Kunth (1850) : Downingia *Torr.*
Wormia Vahl (1810) : Ancistrocladus *Wall.*

Xylophylla L. (1771) p.p. : Exocarpus *Labill.*
Xylophyllos Rumph. (1755) : Exocarpus *Labill.*
Xylopicrum P. Br. (1756) : Xylopia *L.*

Zoophthalmum P. Br. (1756) : Mucuna *Adans.*
Zulatia Neck. (1790) : Miconia *Ruiz et Pav.*
Zygia [P. Br. ex] Boehm. (1760) : Pithecolobium *Mart.*
Zygomenes Salisb. (1812) : Cyanotis *D. Don*

XX.—MISCELLANEOUS NOTES

The following appointments to the Staff of the Royal Botanic Gardens, Kew, have been made by the Minister of Agriculture:—Miss M. L. GREEN, M.A., to be Sub-Assistant for the Index Kewensis, Mr. E. NELMES, formerly a Student Gardener, to be Sub-Assistant in the Library.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. C. B. GARNETT, B.A., to be District Agricultural Officer, Tanganyika Territory; Mr. H. J. TAYLOR to be Supervisor, Agricultural Department, Kenya; Mr. J. W. JOLLY to be Assistant Agricultural Inspector, Federated Malay States.

We learn that Mr. F. ASHBY, B.Sc., (*K.B.* 1921, 319), has been appointed to the post of Mycologist, in the Imperial Bureau of Mycology; Mr. H. R. BRITON-JONES, Ph.D., Mycologist, Agricultural and Horticultural Research Station, Long Ashton, has been appointed Professor of Mycology, Imperial College of Tropical Agriculture, Trinidad, in succession to Mr. Ashby.

The Classification of Flowering Plants.*—The chief object of this book is to present a revised and up-to-date classification of the Flowering Plants arranged on a phylogenetic system. Like the Genera Plantarum, on which the author bases his general principles, it has the advantage of being the work of one mind and consequently there is a uniform conception of families and lower divisions which does not obtain in many other works of this nature. The general idea of the system now presented, as pictorially shown in the frontispiece, is the arrangement of the Dicotyledons, with which this volume alone deals, in two main sequences. One of these comprising families with a characteristic arborescent habit starts with the Magnoliales and culminates in the Apocynales, Rubiales and Asterales; the other, in which the herbaceous habit predominates, starts with the Ranales and culminates in the Lamiales. These two branches pass equally through the old Archichlamydeae and Metachlamydeae whilst the Apetalae disappear as a phylum and are given affinity to groups through which they are considered as having evolved. The Monocotyledons have a derivative affinity with the Ranales.

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* The Families of Flowering Plants. I. Dicotyledons, by J. Hutchinson, with illustrations by W. E. Trevithick and the author. Macmillan & Co., St. Martin's Street, London, 1926. Pp. 328, illustrations, maps and diagrams. Price £1.

In his Introduction the Author discusses the existing systems of classification and sets out his reasons for the system now advanced and the delimitations of the groups and families set out.

One of the most interesting and useful features of the book, however, is the artificial Key to the Families, for unless the family to which a specimen belongs can be ascertained it is not possible to determine its genus. The present key has been based on macroscopic and easily observed characters. It is not suggested that it will prove infallible but it is hoped that it will enable the student to gain a general knowledge of the families of flowering plants which is so necessary for work in the field, the garden, the herbarium or laboratory. The instructions for the use of the key contain some useful directions which can well be borne in mind for the use of keys in general. As a complement to the key will be found a List of Families with certain more or less constant characters. This will be of great assistance to the student who has to determine a specimen from imperfect and scanty material or perhaps material consisting of vegetative parts only. A useful indication of the direction in which investigation should be made can here be obtained.

With the descriptions of each order and family is given an admirable line drawing of a typical representative with dissections of its characteristic parts whilst the use of line maps to show the distribution of families, genera, or species is a very valuable addition to a work of this kind. The principal genera and plants of particular economic or horticultural interest in each family are referred to, and a glossary and full index complete the work.

The book is well produced and the drawings and maps are clear and exceptionally well executed.

Climate and Soil, their action on plant life.*—The present work is best described as a text-book of physiological plant ecology and originated from a series of lectures given in the winter of 1923–1924 at the Masaryk University of Brno (Brünn). The preface is dated June, 1925, from the south Swedish ecological station of Hollands Vadero. The basic thesis underlying the subject-matter chosen, and its arrangement, is that only by understanding the physiological actions of the various factors influencing plant-life can their ecological value be correctly estimated. However, in each main subdivision laboratory methods and results are closely linked to field studies, and it is shown how causal explanations often depend on physiological experiments. The main chapter headings of this useful book indicate its scope, and are as follows: the light factor; the temperature factor; the water factor; the soil, its formation and general ecological peculiarities; the physical nature and aeration of the soil; the chemical soil factors; the

* Henrik Lundegårdh: Klima und Boden in ihrer Wirkung auf das Pflanzenleben, Jena, Gustav Fischer, 1925, £1 6s. 0d.

micro-organisms of the soil; the carbon dioxide factor; the guiding principles of experimental ecological research. The last chapter is of special interest and importance to all interested in the modern problems of phytogeography. Mention must be made of the numerous references to literature. The author has made a generally successful attempt to bring together the latest facts in each subject with which he deals, and it is pleasing to note that due importance is frequently attached to the researches of British ecologists. The paragraph on mycorhiza is the least satisfactory portion. The work is accompanied by a summary of contents, 113 text-figures (mostly diagrams and graphs), two folded maps and separate indexes to authors, subjects, and plant names.

W. B. T.

Flora of the Presidency of Madras.*—Part vii of this work has appeared within three months of the death of its author, Mr. J. S. Gamble, C.I.E., F.R.S., who had revised the proofs of all but the last few sheets. The present part comprises the families from *Nyctaginaceae* to *Euphorbiaceae*. Four new genera and 25 new species (mostly described in the *Kew Bull.* 1924, p. 386, and 1925, p. 329), and 11 new combinations are included.

Ornamental Trees for Amateurs.†—This book is a companion volume to one on "Shrubs for Amateurs" by the same author, published in 1924. The early chapters deal with such pertinent questions as Cultivation, Transplanting, Pruning, Propagation, Care of Old Trees, and Select Lists of Trees, such as Shelter Trees, Weeping Trees, Trees for Small Gardens, and Trees with Handsome Fruits. The various questions are briefly but clearly dealt with in such a manner that the amateur can have no doubt as to their meaning. The latter part of the book is devoted to a descriptive list of the best and most ornamental trees. The descriptions are necessarily brief, but they are to the point, and give just the information the amateur requires without confusing him with technical terms. Fifteen-full page illustrations add to the value of the book.

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* Flora of the Presidency of Madras, by J. S. Gamble, C.I.E., F.R.S.; published under the authority of the Secretary of State for India in Council. Adlard & Son & West Newman, Ltd., Bartholemew Close, London, E.C. 10s. or Rs. 6 as. 8.

† Ornamental Trees for Amateurs, by W. J. Bean. Published by Country Life, Ltd., 20, Tavistock Street, Covent Garden, London, W.C. 2. 1925, pp. 122, plates 15. Price 5s. net.

Printed under the authority of His Majesty's Stationery Office
By Wyman & Sons, Limited, Fetter Lane, London, E.C.4.

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1926
ROYAL BOTANIC GARDENS, KEW

XXI.—REVISION OF THE GENUS CALYCOLPUS.

L. A. M. Riley.

The genus *Calycolpus* (*Myrtaceae*, tribe *Myrteae*) was established by Berg for the reception of a group of Tropical American species which had been assigned erroneously by previous authors to the genera *Campomanesia*, *Myrtus*, and *Psidium*. It may be distinguished from these genera by its sepals, which are patent in the flower-bud, whereas in *Campomanesia* and *Myrtus* they are appressed to the corolla when in bud, and in *Psidium* they form a closed calyx which splits into segments as the flower expands.

Berg's original account of *Calycolpus* was prepared for, and eventually appeared in, Martius, Flora Brasiliensis, xiv. pars 1, 411, but the fascicle in which it was included was not published until May 1857, and in the meantime Berg's "Revisio Myrtacearum Americae", which contained a slightly abbreviated generic description of *Calycolpus* and descriptions of additional species, had appeared in Linnaea, vol. xxvii. As the Brazilian genera and species of *Myrteae* in Berg's "Revisio" were cited by him from the Flora Brasiliensis, with the generic and specific running numbers employed in that work, but without references to the pages, it is obvious that at the time when Berg prepared his "Revisio" his account of the *Myrtaceae* for the Flora Brasiliensis had been completed but was not yet in type.

The actual date of publication of *Calycolpus* is a little uncertain. The title-page of Linnaea, vol. xxvii. bears the date "1854", but this is obviously incorrect since the volume contains (pp. 473–552) a paper on plants cultivated at Halle during the year 1855. In Flora, 1857, 285, there is the following entry: "Linnaea, Band xxvii. Heft 1–6. 1855"; and in Bot. Zeit. 1857, 27, the entry: "Linnaea, Band xxvii. Heft 1–6. 1856". As the title-page bears the date 1854, and as pp. 473 onwards can hardly have been published before 1856, the various parts of the volume probably appeared at different dates during the period 1854–56. Pfeiffer* gives the date of publication of *Calycolpus* as "1856", and, as he is generally accurate, this date is accepted provisionally in the present paper.

Neither in the Flora Brasiliensis nor in Linnaea, xxvii. did Berg indicate a type-species of *Calycolpus*. If he actually regarded any species as a type, which is uncertain, it was presumably one of the three described in the Flora Brasiliensis, as his manuscript for that work was completed before the manuscript of his "Revisio",

* Nomenclator Botanicus, i. 555 (1873).

(18878.) Wt. 132—21. 1075. 3/26. Wy. & S., Ltd. Gp. 50. (4)

although the latter appeared first. The choice accordingly lies between *C. glaber*, *C. Goetheanus*, and *C. calophyllus*. *C. calophyllus* is the most egregious member of the genus, and may be dismissed as being quite untypical on account of the poorly-developed calyx-lobes. Of the two remaining species *C. Goetheanus* was not only the first described*, but was the one figured by Berg in Flora Brasiliensis. Berg, furthermore, mentioned how *C. glaber* differed from *C. Goetheanus*†, thus implying that the latter was more typical or, alternatively, better known. He also distinguished *C. Schomburgkianus* and *C. Warszewiczianus* from *C. Goetheanus*‡, which might suggest that he regarded that species as a standard. Hence *C. Goetheanus* is here proposed as the standard-species.

So far as I can ascertain, no systematic work on the genus has been published since 1857. During that period much additional material has been collected. I have found it necessary to reduce two of Berg's original species (*C. ovalifolius* and *C. Schomburgkianus*), while I have treated his variety *gracilis* of *C. Kegelianus* as of specific rank. I have described five additional species myself, bringing the total number of species now recognized in the genus *Calycolpus* to twelve.

The genus inhabits exclusively river valleys and low country. The focus is situated in north-eastern South America, especially the Guianas, two species being peculiar to British Guiana, three to Dutch Guiana, and one to French Guiana. Two are confined to the neighbourhood of Pará in Brazil. The most widely distributed member of the genus, *C. glaber*, ranges from Trinidad to the district of Maranhao in Brazil and occurs in all the Guianas, thus including eight species out of the other eleven within its range. There are three outlying species. *C. Goetheanus* is known hitherto only from the Rio Negro; *C. calophyllus* is from the Rio Uaupès and the Rio Guainia, tributaries of the Rio Negro, and from Maypures on the Upper Orinoco; and *C. Warszewiczianus* is peculiar to Panama, being the only species occupying, geographically, a really isolated position.

My thanks are due to the Director of Kew for facilities in preparing this revision, and to the Keeper of the Department of Botany at the British Museum, the Conservator of the Botanic Garden, Brussels, and the Conservators of the University Herbaria at Utrecht and Göttingen, for enabling me to examine type and other specimens. I have also received material assistance from Mr. T. A. Sprague, of Kew, in preparing the account of the publication of the genus.

CLAVIS SPECIERUM.

1. Lobi calycis rotundati, ciliati, ovario breviores.....(1) *calophyllus*.

* *Myrtus Goetheana* Mart. ex DC. Prodr. iii. 240 (1828).

† Mart. Fl. Bras. xiv. pars 1, 412 (1857).

‡ Linnaea, xxvii. 381, 383 (1856).

Lobi calycis obtusi vel acuti, haud ciliati, ovarium aequantes vel superantes ..... 2.

2. Lobi calycis quam lati bis longi vel ultra, plerumque acuti ..... 3.
Lobi calycis longi quam lati vel parum longiores, plerumque obtusi ..... 10.

3. Folia supra pilosa, nervis et rete venularum occultis ; ramuli argute alati ..... (2) *chnoïophyllus.*

4. Folia supra glabra ..... 4.
Folia subtus insigniter reticulata, circiter 10 cm. longa, 4 cm. lata ; lobi calycis circiter bis longi quam lati ..... (11) *glaber*, var. *angustilobus.*
Folia subtus haud manifeste vel ad margines tantum reticulata ..... 5.

5. Folia supra nitida et in sicco fere nigra ; lobi calycis saepe obtusi et vix bis longi quam lati ..... (9) *Goetheanus.*
Folia supra opaca ; lobi calycis plerumque multo longiores quam lati ..... 6.

6. Ramuli quadrangulati et conspicue alati ; lobi calycis 0·7–1 cm. longi, multo longiores quam lati ..... 7.
Ramuli teretes vel subangulati, rarius versus apicem quadrangulati et alati ; lobi calycis 5–8 mm. longi ..... 8.

7. Lobi calycis 8–10 mm. longi ; ovarium in alabastro subglobosum, glabrum vel subglabrum ; folia subrotundata vel late elliptica, haud ultra 6·5 cm. longa ..... 9.
Lobi calycis 7–8 mm. longi ; ovarium in alabastro pyriforme, pilosum praecipue versus basin ; folia ad 10 cm. longa, plerumque anguste elliptica ..... (5) *pyrifer.*

8. Ramuli erecti ; nervi laterales foliorum crebre paralleli, utrinsecus 25–30, sed saepe vix manifesti ; pedicelli 1–2 cm. longi vel ultra ..... (6) *Warszewiczianus.*
Ramuli fere sub angulo recto patentes ; nervi laterales foliorum inaequaliter dispositi, utrinsecus circiter 20, subtus plerumque conspicui ; pedicelli vix 1 cm. longi ..... (7) *gracilis.*

9. Folia basi rotundata vel cordata, supra obscura ; pedicelli 1·2–1·5 cm. longi ; lobi calycis circiter 8 mm. longi, 3 mm. lati ..... (4) *Kegelianus.*
Folia basi cuneata vel acute cuneata, satis concoloria ; pedicelli 1·5–2·5 cm. longi ; lobi calycis 10 mm. longi, 3 mm. lati ..... (3) *megalodon.*

(18878) A 2

10. Folia subrotundata, 2–3·5 cm. longa, marginibus valde revolutis, rete venularum vix manifesto; ramuli pererecti .....(12) *revolutus.*
Folia ovata vel lanceolata, 4·5–10 cm. longa vel ultra, marginibus haud valde revolutis, rete venularum conspicuo; ramuli haud conspicue erecti .....11.

11. Folia lanceolata, haud ultra 7 cm. longa, basi subacuta, nervis lateralibus utrinsecus ultra 20 regulariter subparallelis .....(8) *angustifolius.*
Folia ovata vel ovato-lanceolata, usque ad 15 cm. longa, rarissime infra 7 cm. longa, basi cordata, rotundata, obtusa, vel rarius acuta, nervis lateralibus utrinsecus circiter 20 subirregulariter dispositis .....12.

12. Folia basi cordata vel rotundata, rarissime cuneata; pedicelli 2–4 cm. longi .....(10) *cordatus.*
Folia basi haud cordata nec rotundata; pedicelli ad 7 cm. longi .....(11) *glaber.*

1. **C. calophyllus** (*H.B.K.*) *Berg* in Linnaea, xxvii. 381 (1856), et in Mart. Fl. Bras. xiv. pars 1, 412 (1857).—*Myrtus calophylla* H.B.K. Nov. Gen. et Sp. vi. 133 (1823); DC. Prodr. iii. 239 (1828). VENEZUELA: Maypures, fl. March. *Humboldt and Bonpland* (type); River Guainia, fl. May, *Spruce* 3511. BRAZIL: near Panurè on the river Uaupès, *Spruce* 2670.

I have not seen the type of this species, but Spruce's specimens cited above agree with the original description. According to Spruce's field notes, no. 3511 is a branched tree 20 feet high with a deciduous red bark. The flowers are pink outside and white within.

2. **Calycolpus chnoïophyllus** *Riley*, sp. nov.

Ramuli argute quadrangulares, alati, 3·5 mm. diametro (alis inclusis) 15 cm. infra apicem, brunnei vel cinerascentes, pilosiusculi. *Folia* ovato-oblonga vel ovato-lanceolata, 5–7 cm. longa, 2–3·5 cm. lata, acute cuspidato-acuminata, rarius gradatim acuminata, basi obtusa vel rotundata, margine revoluta, costa supra impressa subtus elevata, nervis et venulis utrinque vix visibilibus, supra cinerea, pilosa, veteriora glabrescentia, subtus fusca, glabra vel sparsissime pilosa; petioli 3–5 mm. longi, pilosi, in alas desinentes. *Flores* axillares, solitarii; pedicelli 0·6–1·4 cm. longi, subcomplanati, pilosiusculi, apice incrassati; bracteolae minutae, triangulatae. *Lobi calycis* e basi latiori oblongi, obtusi, 8 mm. longi, 2 mm. lati, basi 3·5–4 mm. lato, pilosiusculi, intus basi dense pilosi. *Petala* circiter 1 cm. longa, 7 mm. lata, ciliata. *Ovarium* cupulatum, 5 mm. diametro, pilosum praecipue basi, 4-loculare; stylus 8 mm. longus, glaber, subcapitatus. *Fructus maturus* non visus.

British Guiana: Upper Demerara River, fl. Sept., *Jenman* 4137 (type in Herb. Kew.).

On the type sheet of this species is the following note by N. E. Brown:—" = *Abraham* 313 along the Berbice-Rupununi Cattle Trail, in New York Herb. compared April 6, 1923".

3. **Calycolpus megalodon** *Riley*, sp. nov.

Ramuli erecti, argute quadrangulati vel alati, 2·5 mm. diametro 15 cm. infra apicem, fusco-cinerei, glabri, internodiis 2·5–3·5 cm. longis. *Folia* late elliptica, 4·5–6·5 cm. longa, 2–3·5 cm. lata, valde et acute acuminata, basi cuneata saepe acute cuneata, marginibus subrevolutis, coriacea, glabra, satis concoloria, opaca, nervis lateralibus utrinsecus 20–25 patentibus subparallelis utrinque haud conspicuis, rete venularum vix manifesta; petioli 1·5–2·5 mm. longi, supra sparse pilosi. *Flores* solitarii; pedicelli 1·5–2·5 cm. longi, teretes, apice vix incrassati, glabri; bracteolae subulatae, 1–1·5 mm. longae, pilosiusculae. *Lobi calycis* anguste ovati, ad apicem gradatim angustati, 1 cm. longi, fere 4 mm. lati, acuti, utrinque glabri basi intus dense et breviter pilosa excepta. *Ovarium* cupulatum, 4 mm. altum, 5 mm. diametro, glabrum vel subglabrum, 5-loculare, ovulis in quoque loculo circiter 10; stylus 1·2 cm. longus, glaber, obtusus.—*C. Goetheanus* Sagot in Ann. Sci. Nat. sér. 6, xx. 181 (1885), non Berg.

French Guiana: Karouany, *Sagot* 215 (type in Herb. Kew.).

4. **C. Kegelianus** *Berg* in Linnaea, xxvii. 381 (1856), excl. var. *gracilis*; Pulle, Enum. Pl. Surinam, 335, excl. var. *gracilis*.—*C. Kegelianus* var. *robustus* Berg. l.c.

Dutch Guiana: sandy savannahs at Pará, *Wullschaegel* (type in Herb. Brux.).

Berg recognized two varieties of his *C. Kegelianus*: α *robustus* and β *gracilis*. I have seen the type specimens of both and I consider them specifically distinct. I have retained the name *Kegelianus* for the var. *robustus*, as Berg's description of this variety is much more ample tham his description of var. *gracilis*. Furthermore in the case of a species completely divided into varieties the var. α may usually be regarded as the type.

5. **Calycolpus pyrifer** *Riley*, sp. nov.

Arbor parva, 3 m. alta. *Ramuli* erecti, quadrangulati, superne alati, 2·25 mm. diametro 15 cm. infra apicem, fusci, glabri, internodiis 1·3–3·5 cm. longis. *Folia* elliptica vel oblongo-elliptica, 5·5–9·5 cm. longa, 2·2–3·8 cm. lata, longe et acute acuminata, basi oblique obtusa, marginibus revolutis, coriacea, glabra, nitidula, supra cinerea, subtus fusca, nervis lateralibus utrinsecus circiter 20 supra haud conspicuis subtus satis manifestis; petioli 2–3·5 mm. longi. *Flores* in axillis solitarii vel bini; pedicelli 0·8–1·3 cm. longi, complanati, superne incrassati, glabri vel summo tantum pilosi; bracteolae anguste triangulatae, acutae, 1·75–2 mm. longae. *Lobi calycis* anguste triangulati, 7·5–8 mm.

longi, basi 3 mm. lati, subacuti, utrinque pilosiusculi praecipue basi. *Petala* circiter 1·2 cm. longa, 1·1 cm. lata, utrinque pilosiuscula. *Ovarium* in alabastro pyriforme, 4 mm. longum, 4·5 mm. diametro, sparse pilosum, 5-loculare; ovula in quoque loculo circiter 11, plerumque oblonga, fere 0·5 mm. longa. *Fructus* haud visus.

British Guiana: Corentyne River, Sandridge Woods, fl. Oct., *Jenman* 477 (type in Herb. Kew.); Essequibo, Ikuraka Lake, fl. Oct., *Altson* 158.

6. **C. Warszewiczianus** *Berg* in Linnaea, xxvii. 382 (1856).—*C. glaber* Hemsl. Biol. Centr.-Amer. Bot. i, 407, partim, non Berg.

Panama: in meadows near the city of Panama, *Seemann* 282; Chagres, hilly region, fr. Feb., *Fendler* 105; near Panama, fl. Sept., *Sutton Hayes* 404; in woods near Rio Grande Station, fl. and fr. Jan., *Sutton Hayes* 472; without precise locality, *Barclay* (Mus. Brit.).

A shrub or small tree 5–20 ft. high with rose-coloured flowers.

I have identified the above specimens from Berg's description. The type, which I have not seen, was collected by Warszewicz "in America australi" according to Berg. Warszewicz travelled extensively in Central America, visiting Panama among other countries, and, in view of the close agreement of the above specimens with Berg's description, it seems probable that Panama is the country whence the type came.

There is, in the Kew Herbarium, a sheet of *Calycolpus* bearing the legend "Sellow, S. Brazil" in Sir William Hooker's writing. This specimen is specifically quite indistinguishable from the rest of the material I have cited. In view of the apparent discontinuity of distribution, and especially as Berg cites no specimen of Sellow under the genus *Calycolpus* either in Linnaea or in the Flora Brasiliensis, I have come to the conclusion that Sir William Hooker was in error in attributing this specimen to Sellow, and that it was probably collected in Panama, possibly by Seemann.

7. **Calycolpus gracilis** (*Berg*) *Riley*, sp. nov.

Frutex 6-8 pedalis (Kegel). *Ramuli* graciles, teretes, apice tantum quadrangulati vel subalati, rugulosi, fusco-cinerei, ultimis fere sub angulo recto patentibus. *Folia* ovata, ovato-elliptica, vel anguste lanceolata, 5–9·5 cm. longa, 2–4 cm. lata, longissime et acute acuminata, basi cuneata vel acuta, vix revoluta, supra opaca, subtus pallidiora et subnitentia, nervis lateralibus utrinsecus circiter 20, supra satis subtus praecipue manifestis rete venularum utrinque vix visibili; petioli 2–3 mm. longi. *Pedicelli* 9 mm. longi. *Calycis lobi* anguste et acute triangulati, circiter 8 mm. longi, 2·5–3 mm. lati, glabri. *Flos* apertus, in sicco, 2 cm. diametro. *Ovarium* globosum, glabrum.—*C. Kegelianus* var. *gracilis* Berg in Linnaea, xxvii. 382; Pulle, Enum. Pl.

Surinam, 335. *Psidium aromaticum* Schauer in Linnaea, xxi. 272. non Aubl.
Dutch Guiana: in woods near Mariepaston, fl. May, *Kegel* 1341 (type in Herb. Göttingen.).

I have compared this specimen, which is the type of *C. Kegelianus* var. *gracilis* Berg, with the type of *C. Kegelianus* var. *robustus* Berg, and I have no hesitation in treating it as specifically distinct. The whole facies of the plant is different, and, in detail, I note especially the terete branchlets spreading at right angles, the thinner narrower leaves, acute or cuneate at the base, and the much shorter pedicels.

There is only one flower on the specimen, and, on this account, I have forborne to dissect it.

8. **Calycolpus angustifolius** *Riley*, sp. nov.

Ramuli ascendentes vel subpatentes, teretes vel iuniores subquadrangulati, 3 mm. diametro 15 cm. infra apicem, fusci, glabri, internodiis 2–4·5 cm. longis. *Folia* lanceolata, rarius ovato-lanceolata, 4·5–7 cm. longa, 2–3 cm. lata, acute acuminata, basi subacuta vel acute cuneata, marginibus subrevolutis, glabra, supra fere nigra, nitida, subtus fusca, nitidula, nervis lateralibus utrinsecus ultra 20 subparallelis utrinque satis conspicuis; petioli 2·5–4 mm. longi, glabri. *Flores* in axillis 1–4-fasciculati; pedicelli 2–3 cm. longi, glabri, apice subcompressi vix incrassati; bracteolae 0·75–1 mm. longae, obtuse triangulatae. *Lobi calycis* ovati, 6·5 mm. longi, 4 mm. lati, obtusi, utrinque glabri. *Petala* rotundata, 1·1 cm. longa 1·3 cm. lata, basi truncata, utrinque glabra, minute ciliata. *Filamenta* circiter 6 mm. longa; antherae 1·5 mm. longae. *Ovarium* campanulatum, 4 mm. altum, 4 mm. diametro, glabrum; stylus 9·5 mm. longus, subcapitatus, glaber. *Fructus* subglobosus, 8–9 mm. diametro; semina subreniformia, 3·5 mm. alta, 2·5 mm. diametro, fulva, laevigata, nitida.
Brazil: Pará, thick forest S.E. of S. José, fl. and fr. Dec., *Burchell* 9754 (type in Herb. Kew.).

9. **C. Goetheanus** (*Mart. ex DC.*) *Berg* in Linnaea, xxvii. 381 (1856), et in Mart. Fl. Bras. xiv. pars 1, 412, tt. 6, f. 129, 43 (1857).—*Myrtus? Goetheana* Mart. ex DC. Prodr. iii. 240 (1828).
Brazil: Rio Negro, *Martius;* near Barra, fl. and fr. Feb., *Spruce* 1340, fl. Oct., *Spruce* 1804, 1840.

In the description in the Prodromus, De Candolle associates with Martius' specimen a plant collected by Parker near Demerara. Berg does not cite Parker's specimen under *Calycolpus Goetheanus*. In the Kew Herbarium there are three sheets of a *Calycolpus* collected by Parker at Demerara, but these represent a variety of *C. glaber* and certainly cannot be referred to *C. Goetheanus* on account of the quite different venation of the leaves. I have not seen Martius' specimen, but the material of *Spruce* 1340 and 1804 agrees both with the description in the Prodromus and with the figure in Mart. Fl. Bras. The material of *Spruce* 1840 has propor-

tionately broader leaves, and Spruce has written on the label that it "seems distinct from 1804". I cannot, however, find any character of sufficient importance to justify separating it.

According to Spruce's field notes, *C. Goetheanus* is a bush or bushy tree, 6–20 ft. high, with deciduous bark and brown polished stems. The flowers are white and odoriferous, and the fruit green.

The specimen in the Göttingen Herbarium collected by Nolte in Surinam, and referred by Pulle (Enum. Pl. Surinam 335) to *C. Goetheanus*, is *C. glaber* (Benth.) Berg.

10. **Calycolpus cordatus** *Riley*, sp. nov.

Arbor parva. *Ramuli* subteretes, superne quadrangulati, 2·75 mm. diametro 15 cm. infra apicem, ascendentes, cinerei vel fusci, glabri, internodiis 1·5–3·5 cm. longis. *Folia* ovata, rarius elliptica, 4–8·5 cm. longa, 1·5–4·5 cm. lata, cuneato-acuminata, acuta, basi cordata vel rotundata, rarissime cuneata, marginibus revolutis, supra nigro-brunnea, nitida vel subnitida, subtus pallidiora, subnitida, utrinque glabra, nervis lateralibus utrinsecus 12–18 irregulariter dispositis supra manifestis subtus cum rete venularum et nervo inframarginali conspicuis; petioli 2–3 mm. longi, glabri. *Flores* in axillis 1–3-fasciculati; pedicelli 1·5–2·5 cm. longi, glabri, subcompressi, versus apicem incrassati; bracteolae ovatae, 0·75–1 mm. longae, subacutae, sparse ciliatae. *Lobi calycis* ovati, 5 mm. longi, 3 mm. lati, obtusi vel subrotundati, utrinque glabri, basi intus pilosa excepta. *Petala* alba, obovata, 1·7 cm. longa, 1 cm. lata, integra, glabra. *Filamenta* circiter 8 mm. longa; antherae 1 mm. longae. *Ovarium* cupulatum, 3–4 mm. altum, 3·75–5 mm. diametro, glabrum, 5-loculare; stylus 1·4 cm. longus, oblique capitatus, glaber; ovula oblonga, vix 0·5 mm. longa. *Fructus* subglobosus, 1·8 cm. diametro; semina subreniformia, 3·25 mm. longa, 2·5 mm. lata, lutea, sub lente regulariter et gracillime reticulata.

Brazil: Pará; Caripi, fl. Aug., *Spruce* 116 (type in Herb. Kew.); Caripi, fr. Aug., *Spruce* sine numero; Caripi, on the beach, fl. Sept., *Spruce* 144; forest S.E. of S. José, fl. Nov., *Burchell* 9719.

In Burchell's specimen the leaves are mostly narrower and more often obtuse at the base than those of the type; they are also frequently gradually acuminate rather than cuspidate-acuminate.

11. **C. glaber** (*Benth.*) *Berg* in Linnaea, xxvii. 379 (1856); Mart. Fl. Bras. xiv. pars 1, 411 (1857); Linnaea, xxx. 708; Pulle, Enum. Pl. Surinam, 335 (1906).—*Campomanesia glabra* Benth. in Hook. Journ. Bot. ii. 319 (1840). *Calycolpus Schomburgkianus* Berg in Linnaea, xxvii. 380; Linnaea, xxx. 708; Ndz. in Engl. Pflanzenfam. iii. Abt. 7, 66, f. 34, G-J. *C. ovalifolius* Berg, l.c. 379; Griseb. Fl. B.W.I. 241. *C. Goetheanus* Pulle, l.c., non Berg. *Calycolpus* sp. Riley in Kew Bull. 1925, 136. *Psidium fluviatile* Miq. in Linnaea, xxii. 169 (1849), non Rich. (fide Berg).

Trinidad: Arima, *Crueger* 35; Aripo, *Crueger*; Cumuto road, 30 m., fl. May, *Riley* 97 (Herb. Kew.); Irois, *Crueger* 215, *Trin.*

Herb. no. 2321; between Pitch lake and Guapo Beach, *Trin. Herb.* no. 2317; Maraccas, *Trin. Herb.* no. 1729; Cedros, Coromandel, *Broadway* 9410; without locality, *Trin. Herb.* no. 1302. BRITISH GUIANA: Pomeroon river, *Schomburgk* 866, (1476 R.); Bartica Grove, *Jenman* 2430, 4749; Mazaruni, Appun 389, *Jenman* 628, 660, 715, 740, 5269; Potaro river below the Kaieteur, *Jenman* 1000; Essequibo, *Schomburgk* 2 (type), 5 (237), 289; Pirara, *Schomburgk* 302; Demerara river, *Jenman* 3831, 3922, 4931; Roraima, *Schomburgk* 266; Demerara, *Parker*; without locality, *Drake*. DUTCH GUIANA: *Nolte* (Herb. Göttingen). FRENCH GUIANA: *Poiteau*. BRAZIL: Maranhao, in dry woods, fl. June, *Gardner* 6027.

I have not seen *Kappler* 1700 from Dutch Guiana, nor *Poeppig* 2935 from the province of Pará in Brazil, both cited as *C. glaber* by Berg in Mart. Fl. Bras., and have therefore preferred not to cite them myself.

The pedicels in Gardner's plant are shorter than is usual in *C. glaber*, the longest measuring 1·3 cm. With this exception the specimen agrees well with the type.

I include under *C. glaber* two of Berg's species, viz.:— *C. ovalifolius* from the West Indies and *C. Schomburgkianus* from British Guiana. I have not had access to the type of the former, but, from Berg's description, I can detect no point of difference from the broader-leaved forms of *C. glaber*. Moreover I have seen no specimens of *Calycolpus* from any of the West Indies with the exception of Trinidad, and all the Trinidad material is referable to *C. glaber*. In the same way I have united *C. Schomburgkianus* with *C. glaber* on account of the number of transitional forms which I have seen. Berg describes the ovary of *C. Schomburgkianus* as 5-locular while Bentham says that the ovary of *C. glaber* is 4-locular. But I dissected an ovary of the type of *C. Schomburgkianus* and found it to be 4-locular, and I think little reliance can be placed on this character.

C. glaber var. **angustilobus** *Riley*, var. nov.

A typo lobis calycis 5–6 mm. longis, 2–2·75 mm. latis, quamobrem bis longis quam latis vel ultra, plerumque acutis recedit.

BRITISH GUIANA: Demerara, *Parker*.

I have hesitated to describe any forms of *C. glaber* as varieties, for the species is most variable in the shape both of the leaves and of the calyx-lobes, and considerable variation sometimes occurs even on an individual branch. But in the variety described above the proportionately narrow calyx-lobes are peculiar and constant in the three sheets of material in the Kew Herbarium. The group seems quite distinct among the wide range of material of *C. glaber* to which I have had access.

12. **C. revolutus** (*Schauer*) *Berg* in Linnaea, xxvii. 383; Pulle, Enum. Pl. Surinam, 335 (1906).—*Myrtus revoluta* Schauer in

Linnaea, xxi. 272. *M. calophylla* Miq. Stirp. Sur. 35 (1850), non H.B.K.

Dutch Guiana: sandy places near Joden-Savannah, fl. Nov., *Kegel* 1148 (type in Herb. Göttingen.); sandy savannahs at Pará, *Wullschaegel*; Surinam River, *Focke* 236; near Savanne Kompas, *Went* 390.

I have seen Kegel's specimen only. Miquel (l.c.) identified Focke's specimen as *Myrtus calophylla* H.B.K., and distinguished a variety "β foliis minoribus", citing *M. revoluta* Schauer as a synonym, together with the reference to Kegel's plant. He gives the length of the leaves in Focke's specimen as 1·5–2·5 inches and the peduncles half as long as the leaves. The leaves in typical *C. revolutus* are 1–1·25 inches long, and the peduncles nearly equal the leaves. Pulle (l.c.) includes all the specimens cited above in *C. revolutus*.

The small roundish leaves distinguish *C. revolutus* from any other species I have seen. The leaves are dull on both surfaces and the venation generally inconspicuous, though the mid-rib is prominent on the under surface. The branchlets are most noticeably ascending and 4-winged. The revolute margins and recurved acumen of the leaves are conspicuous. The ovary and the exterior of the calyx-lobes are slightly hairy.

Species excludenda.

C. parviflorus Sagot in Ann. Sci. Nat. sér. 6, xx. 181 (1885).

From the description this should not be included in the genus *Calycolpus* as Sagot himself suspected. It is evidently related to *Eugenia*.

XXII.—CONTRIBUTIONS TO THE FLORA OF SIAM.*

ADDITAMENTUM XVIII. W. G. Craib.

Ryparosa inconstans *Craib* [Flacourtiaceae]; a *R. Scortechinii* King foliorum nervis lateralibus numerosioribus recedit.

Arbor 8-metralis (ex *Kerr*); ramuli iuventute adpresse ferrugineo-pubescentes, mox glabri. *Folia* oblongo-oblanceolata vel oblongo-elliptica, apice acuminata, summo apice mucronata, basi cuneata vel cuneato-rotundata, 37–70 cm. longa, 13·5–17 cm. lata, chartaceo-coriacea, glabra, subtus pallidiora, nervis lateralibus utrinque 10–12 arcuatis superioribus intra marginem conspicue anastomosantibus supra conspicuis vel prominulis, subtus prominentibus, nervulis rete pagina superiore conspicuum vel prominulum inferiore prominulum vel prominentem efficientibus, petiolo ad 7·5 cm. longo apice ad 15 mm. valde incrassato supra basi plano suffulta. *Racemi* ♀ e caule orti, ad 40 cm. longi (pedunculo communi brevi incluso), rhachi breviter adpresse ferrugineo-pubescente, pedicellis brevibus. *Calycis* segmenta deltoidea, obtusa, 3·5 mm. longa,

* Continued from *Kew Bull.* 1925, p. 423.

3 mm. lata, dorso ferrugineo-puberula. *Petala* oblonga, 3·5 mm. longa, fere 2 mm. lata, dorso basi excepta adpresse ferrugineo-pubescentia, intra sparse pilosa, basi squamula dense hirsuta 2 mm. longa instructa. *Ovarium* subglobosum, basi angustatum, dense ferrugineo-hirsutum; stigmata 2 vel interdum 3, subsessilia. *Fructus* saepissime 2-lobatus, apice retusus, ambitu oblongus, 2 cm. longus, ad 3 cm. latus, vel rarius 3-lobatus, apice concavus, ad 3 cm. diametro, fusco-brunneus, plus minusve verrucosus, glabrescens.

Pattani, Bachaw, 500 m., evergreen forest; fruit from trunk to about 2 m. above ground, *Kerr* 7179.

Erythroxylum oblanceolatum *Craib* [Erythroxylaceae]; ab affini *E. Wallichii* O. Sch. foliis longioribus recedit.

Frutex circa 1·5 m. altus (ex *Kerr*), glaber; ramuli iuventute compressi, brunnei vel pallide brunnei, mox teretes, brunneo- vel pallide brunneo-corticati. *Folia* oblanceolata, apice obtusa vel acuta, interdum acuminata, costa excurrente apiculata, basi cuneata, 6–12 cm. longa, 1·8–3·4 cm. lata, sat rigida, supra micantia, subtus pallidiora, opaca, nervis lateralibus utrinque circa 12 intra marginem anastomosantibus pagina utraque subconspicuis, costa supra conspicua vix impressa subtus prominente, margine recurva, petiolo 4–8 mm. longo supra canaliculato suffulta; stipulae 6 mm. longae, dorso bicarinatae, apice setula brevi fugace instructae, cito deciduae. *Flores* axillares, pedicello 4–5 mm. longo suffulti. *Sepala* oblongo-ovata, acuta, 1·75 mm. longa, 1 mm. lata. *Petala* oblonga, fere 3·5 mm. longa, 1·5 mm. lata, dorso medio conspicue carinata, ungui 1 mm. longo, lamina vix 2·5 mm. longa, ligula 1 mm. alta. *Urceolus* stamineus calycem subaequans vel eo paulo altior, circa 1·5 mm. altus, apice denticulatus; filamenta circa 2·25 mm. longa, antheris circa 0·6 mm. longis. *Ovarium* glabrum, 1·25 mm. altum; styli (floris brevistyli) ad 0·75 mm. connati, parte libera 0·6 mm. longa.

Surin, Sangka, 300 m., open evergreen forest, *Kerr* 8310.

Hiptage bullata *Craib* [Malpighiaceae-Hireae]; ab affini *H. candicante* Hook. f. habitu et calycis glandulis haud solitariis distinguenda.

Frutex volubilis; ramuli primo dense fulvo-tomentosi, mox pallide tomentelli, demum glabri, brunneo-corticati. *Folia* oblongo-ovata, ovata, vel oblonga, apice breviter obtuse acuminata, basi rotundata, interdum cordata, 7–14·5 cm. longa, 3–7·7 cm. lata, chartaceo-coriacea vel coriacea, supra primo fulvo-tomentosa, matura glabra vel hic et illic puberula, subtus densius albo-tomentella, costa subtus prominente, nervis lateralibus utrinque circa 5 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervulis supra conspicuis vel subprominulis subtus prominulis, lamina basi biglandulosa, glandulis saepe in petiolum decurrentibus, petiolo 7–10 mm. longo supra canaliculato indu-

mento ei ramulorum simili tecto suffulta. *Racemi* et in axillis foliorum delapsorum et ramulos breves terminantes, ad 15 cm. (pedunculo communi circa 2·5 cm. longo incluso) longi, rhachi pedicellisque indumento ei ramulorum simili obtectis, bracteis bracteolisque deciduis; pedicelli 8–10 mm. longi, paulo infra medium articulati. *Sepala* oblonga vel rotundato-oblonga, apice rotundata, circa 2 mm. longa et 1·5 mm. lata, dorso densius adpresse hirsuta, intra basi parce pilosa, glandulis parvis saepissime alternantia. *Filamenta* glabra. *Ovarium* hirsutum, stylo glabro.

Mê Ping Rapids, Kêng Ap Nang, 180 m., *Kerr* 2945 (*type*). Raheng, Hui Haht Yuak, 450 m., *Winit* 117.

The flowers are recorded as white with a yellow patch at the base of the lower petals.

Hiptage condita *Craib* [Malpighiaceae-Hireae] ; ab affini *H. lucida* Pierre pedicellis supra medium articulatis, sepalis plus minusve rotundatis dorso ferrugineo-pubescentibus recedit.

Ramuli iuventute fusci, pilis paucis ferrugineis adpressis praesertim ad nodos instructi, cito glabri, cortice plus minusve cïnereo prominenter lenticellato obtecti. *Folia* oblongo-lanceolata vel oblonga, apice obtuse acuminata, interdum rotundata, basi cuneata vel rotundato-cuneata, 4·5–8·5 cm. longa, 2·5–3·5 cm. lata, coriacea, pagina utraque glabra vel inferiore inferne saepe pilis paucis ferrugineis adpressis medifixis instructa, nervis lateralibus utrinque 4–7 intra marginem anastomosantibus supra conspicuis vel subconspicuis subtus cum nervis transversis prominulis, margine integra, cartilaginea, petiolo 5–8 mm. longo glabro supra canaliculato suffulta. *Racemi* circa 8 cm. longi, pedunculo communi 1–2 cm. longo suffulti, solitarii, terminales vel saepissime paniculam foliaceam terminalem ad 15 cm. longam formantes, rhachi sparse adpresse ferrugineo-pubescente; pedicelli 12 mm. longi, basi bractea vix 2 mm. longa et ad medium infra articulationem bracteolis duabus circa 1·5 mm. longis instructi, supra medium articulati, sparse breviter ferrugineo-pubescentes, primo recti, obliqui, sub anthesin ad articulationem genuflexi. *Sepala* rotundata vel late ovata, apice rotundata, ad 3 mm. diametro, sat crassa, dorso sparse adpresse ferrugineo-pilosula, intra glabra, margine recurva, ciliolata, glandulis calycinis haud conspicuis 1–2 parvis tantum. *Petala* alba (ex *Garrett*), orbicularia vel obovata, 10–11 mm. longa, 9–10 mm. lata, fimbriata, stipite 2 mm. longo suffulta, dorso medio sparse adpresse ferrugineo-pubescentia. *Stamina* 10, antheris 1·5 mm. longis, filamento unico 9 mm. longo, aliis 5 mm. longis, omnibus glabris inferne incrassatis parum complanatis basi inter se brevissime connatis. *Ovarium* 3-lobatum, lobis processibus tribus complanatis sparse pubescentibus instructis; stylus unicus 1 cm. longus, glaber, duobus aliis vix evolutis haud 1 mm. longis. *Fructus* 3-alatus, pilis brevibus adpressis ferrugineis medifixis sparsis instructus, ala maiore oblongo-oblanceolata 2 cm. longa 8 mm. lata, duabus minoribus 12 mm. longis 7 mm. latis, styli basi persistente aliformi coronatus.

Chiengrai, Mê Kok, Doi Tam Tu Pu, 530 m., precipitous limestone peak, *Garrett* 154.

Hiptage detergens *Craib* [Malpighiaceae-Hireae]; ab affini *H. sericea* Hook. f. glandula calycina plus minusve circulari haud elliptica et in pedicellum haud conspicue decurrente recedit.

Ramuli iuventute adpresse hirsuti, cito parum glabrescentes, lenticellis parvis rotundatis vix conspicuis, cortice brunneo obtecti. *Folia* oblongo-elliptica vel oblongo-lanceolata, apice acute acuminata, basi rotundata vel late cuneata, 3–5 cm. longa, 1·5–2 cm. lata, coriacea, iuventute pagina utraque dense adpresse pubescentia, cito glabrescentia, matura glabra vel subtus ad costam adpresse pubescentia, saepe ad basem vel prope basem biglandulosa, supra lucida, subtus pallidiora, costa supra subprominula subtus prominente, nervis lateralibus utrinque circa 8 rectis vel subrectis bene intra marginem anastomosantibus supra obscuris subtus subprominulis, margine integra, petiolo ad 5 mm. longo indumento ei ramulorum simili tecto suffulta. *Racemi* foliis breviores, et axillares et terminales; pedicelli 7 mm. longi, paulo infra medium articulati et bracteolis duabus angustis 1·5 mm. longis instructi, indumento ei ramulorum simili tecti, basi bractea bracteolis simili decidua instructi. *Sepala* oblonga, apice rotundata vel obtusa, 2·5 mm. longa, 1·5 mm. lata, dorso adpresse pubescentia, ciliata; glandula calycina solitaria, 2 mm. diametro, haud vel vix decurrens. *Petala* manca, orbicularia vel deltoideo-ovata, basi cordata, 6–7 mm. longa, 6 mm. lata, dorso pubescentia, margine denticulata vix fimbriata, longius ciliata, ungui ad 2 mm. longo pubescente suffulta. *Filamenta* glabra, longiora circa 7 mm. longa. *Ovarium* pubescens, stylo glabro.

Pang-nga, Pulau Panji, *Haniff and Nur* 4007.

Brachylophon anastomosans *Craib* [Malpighiaceae-Banisterieae]; a *B. Scortechinii* King foliorum nervis lateralibus pauciori-bus crassioribus bene intra marginem anastomosantibus, a *B. Curtisii* Oliver foliis tenuioribus, ab ambobus rhachi graciliore glabro, pedicellis brevioribus recedit.

Suffrutex ad 1 m. altus (ex *Kerr*); ramuli graciles, angulati, internodiis glabri vel hic et illic minute puberuli, ad nodos conspicue cinnamomeo-barbati, cinnamomei, lenticellis inconspicuis. *Folia* opposita, inaequilateralia, latere altero dimidiatim oblongo-elliptica, altero dimidiatim oblanceolata, apice acuminata vel caudato-acuminata, acuta, basi latere altero latius cuneata, altero acuminata, 11–15 cm. longa, 4–5 cm. lata, membranacea vel chartaceo-membranacea, supra viridia, subtus pallidiora, glabra, nervis lateralibus utrinque 7–9 rectis bene intra marginem anastomosantibus supra gracilibus subprominulis subtus prominentibus, nervulis paucis subtus prominentibus vel prominulis, margine anguste recurva, petiolo ad 7 mm. longo supra canaliculato suffulta. *Racemi* axillares, ad 11 cm. longi (pedunculo communi ad 2 cm. longo incluso), nodosi, angulati, glabri; pedicelli circa 4 mm.

longi, basi parvi-bracteati. *Sepala* 5, imbricata, oblongo-elliptica, obtusa, 2·5 mm. longa, 1·5 mm. lata, ciliolata. *Petala* oblonga, apice rotundata, basi truncata, stipite brevi instructa, 11 mm. longa, 5 mm. lata. *Antherae* 4 mm. longae; filamenta inaequalia, 5 recta, 2 mm. longa, 5 ad medium refracta, parte dimidia superiore horizontaliter radiante, circa 4 mm. longa. *Ovarium* 1·25 mm. altum, glabrum, 3-lobatum, 3-loculare, ovulis solitariis pendulis; styli 3, graciles, pallidi, circa 7·5 mm. longi, e basi liberi, divergentes. *Fructus* glaber, viridis, reticulatus, stylorum basibus persistentibus induratis apiculatus, ad 1 cm. longus.

Pattani, Banang Sta, 50 m., forming great part of undergrowth in evergreen forest on limestone, *Kerr* 7306.

Connaropsis varians *Craib* [Oxalidaceae]; a *C. glabra* Ridl. foliis maioribus haud semper simplicibus, pedicellis longioribus recedit.

Ramuli graciles, iuventute ferrugineo-tomentelli, angulati, mox crasse puberuli, demum glabri et teretes, cortice brunneo vel cinereo-brunneo obtecti, lenticellis haud conspicuis. *Folia* saepissime simplicia, interdum more trifoliatim pinnata sed foliolo laterali altero haud evoluto altero terminali simili sed conspicue minore, ovato-oblonga vel ovato-lanceolata, apice obtuse acuminata, basi rotundata, 7–14 cm. longa, 3–6·5 cm. lata, rigide chartacea, glabra, pagina superiore sicco fusco-brunnea, inferiore brunnea, nervis lateralibus utrinque 5–8 bene intra marginem anastomosantibus supra subprominulis subtus cum costa prominentibus, nervulis supra conspicuis interdum subprominulis subtus rete prominulum efficientibus, margine integra, anguste cartilaginea, petiolo usque ad 15 mm. longo ad medium articulato suffulta. *Inflorescentiae* binae, axillares, racemiformes, usque ad 4 cm. longae, breviter pedunculatae; rhachis sparse pubescens; bracteae parvae, ferrugineo-pubescentes; pedicelli 3–4 mm. longi, sub anthesin graciles, apicem versus incrassati, subglabri, cito conspicue incrassati. *Sepala* 5, imbricata, exteriora 2 mm. longa, 2·75 mm. lata, interiora paulo angustiora et longiora, omnia ciliolata et dorso parce glanduloso-puberula. *Petala* 5, linearia, 5·5 mm. longa, 0·6 mm. lata. *Filamenta* vix 3 mm. longa, antheris parvis. *Pistillum* 2·5 mm. altum, stylis 5.

Pattani, Betong, 400 m., high evergreen forest, *Kerr* 7680.

Geranium siamense *Craib* [Geraniaceae]; ab affini *G. nepalense* Sweet pedicellis saepissime multo longioribus pilis adpressis haud patulis instructis, sepalis oblongis longius mucronatis 5-nerviis recedit.

Caules ad 40 cm. longi, subgraciles, sicco plus minusve brunnescentes, primo pilis deflexis albis sat rigidis densius tecti, mox plus minusve glabrescentes, basi glabri, ad medium vel ultra medium defoliati. *Folia* basalia ambitu 5-angulata vel reniformia, ad 4 cm. diametro, ultra medium sed haud ad basem 5-lobata, lobis obovato-rhomboideis ad 2 cm. longis vix 2 cm. latis supra

medium utrinque 2–3-lobulatis, lobulis mucronatis, chartacea, supra viridia, pilis albis sat rigidis conspicuis sed subsparsis tecta, subtus plus minusve rubra, rarius pallide viridia, pilis albis sat rigidis divergentibus ad nervos nervulosque instructa, nervis nervulisque supra impressis subtus prominentibus, petiolo ad 20 cm. longo suffulta, caulinia opposita, rarius alterna, basalibus similia sed parum minora, petiolo ad 1·5 cm. longo vel rarius usque ad 8 cm. longo, suprema petiolo 2–3 mm. longo suffulta; stipulae inter se fere omnino liberae, omnino connatae, vel in unam apice plus minusve lobatam connatae, ad 5 mm. longae, dorso parce pubescentes, cito glabrescentes, ciliatae. *Pedunculi* 5–9 cm. longi, biflori, indumento ei caulium simili tecti, pedicellis 2·5–4 cm. longis similiter sed densius tectis; bracteae stipulis similes; flores rosei (ex *Kerr*). *Sepala* oblonga, apice parum retusa et mucrone 1·75 mm. longo instructa, mucrone excluso 1 cm. longa, 3·75 mm. lata, 5-nervia, intra glabra, extra ad costam setis instructa, aliter breviter adpresse pubescentia, margine latius membranacea, ciliata. *Petala* obovata, apice retusa, basi angustata, 17 mm. longa, 11·5 mm. lata, basi intra parce pubescentia, inferne ciliata. *Filamenta* 8–9 mm. longa, basi oblongo-elliptica, parte lineari inferne pubescentia, parte basali dorso adpresse pubescentia, intra glabra vel interiora pilis paucis elongatis ima basi medio instructa. *Carpella* 1 mm. alta, pilis longis albis obtecta; styli 8 mm. longi, parte dimidia superiore glabri, inferiore pilis divergentibus albis rigidis distantibus instructi.

Doi Chiengdao, 2100 m., abundant on open rocky ground, *Kerr* 6601.

Impatiens calcicola *Craib* [Balsaminaceae]; species nova *I. verruciferae* Hook. f. similis sed herbacea, caule haud verrucoso, sepalis maioribus asymmetricis, alarum lobo distali bilobato differt.

Caulis erectus, 15–60 cm. altus, aquosus, inferne usque ad medium nudus, basi circa 1·5 cm. diametro, purpureo-suffusus vel plus minusve maculatus, simplex vel supra medium ramosus, iuventute puberulus, cito glaber. *Folia* alterna, rarissime subopposita, oblongo-ovata vel oblongo-obovata, apice breviter acuminata, mucronulata, basi attenuata vel cordatula, haud rarius inaequilateralia, ad 16 cm. longa et 8·5 cm. lata, sat crassa, pagina utraque plus minusve breviter puberula, superiore glabrescentia, viridia, inferiore pallidius viridia, nervis lateralibus utrinque 12–16 supra parum impressis subtus prominentibus, nervulis vix conspicuis, margine parte basali excepta crenata, crenis apiculatis, limbo ima basi vel ad 2 cm. supra basem glandula viridi subtus utrinque instructo, petiolo 0·5–7·5 cm. longo primo breviter puberulo supra plano suffulta; glandulae infrapetiolares deficientes. *Pedicelli* axillares, solitarii vel gemini, vix 2·5 cm. longi, densius puberuli, basi parvi-bracteati, pedunculo communi vix evoluto. *Sepala* 5; duo antica membranacea, oblonga vel lanceolata, 1·5–5 mm. longa, 0·75–2 mm. lata, latere antico fere ad medium longius

cornuta, in exemplo uno ad 1 cm. longa et 0·5 cm. lata, cornu deficiente; duo lateralia viridi-alba, apice viridia, valde inaequilateralia, latere altero dimidiatim elliptico-oblonga, altero dimidiatim cuneata, apiculo 2·5 mm. longo instructa, 1·8–2 cm. longa, 1·5 cm. lata, extra puberula, intra glabra; posticum (labellum) limbo cymbiformi vel saccatim infundibulari apiculato 1·5 cm. longo, ore recto late elliptico circa 1·5 cm. diametro, extra pallido intra praesertim antice aurantiaco-maculato, calcare crasso 4–5 mm. longo alte bifido, segmentis apice rotundatis breviter obtuse apiculatis, pallido. *Vexillum* pallidum, oblongum vel oblongo-obovatum, apice emarginatum, ad 1·7 cm. longum et 1·2 cm. latum, costa dorso medio inferne carina fere 8 mm. longa et 4 mm. alta rotundata margine viridi instructum et paulo infra apicem cuspidatum; alae inter se connatae, stipite incluso 3–3·5 cm. longae, 1·5 cm. latae, intra medio basi carinatae, lobo basali subquadrato 0·8–1 cm. longo 1–1·6 cm. lato, distali ad 2 cm. longo et 1·2 cm. lato apice altius inaequaliter bilobato, lobulo altero lineari altero deltoideo, lilacinae, intra basi medio et lateribus aurantiacae et rubro-maculatae. *Filamenta* 6 mm. longa, antheris connatis pallidis verruculosis. *Ovarium* viride, circa 7 mm. longum, glabrum, longitudinaliter costatum.

Ratburi, 50–200 m., crevices of limestone rocks, *Kerr* 8991 (*type*), *Marcan* 1761.

The description has been drawn up from plants raised at Aberdeen from seed forwarded by Dr. A. F. G. Kerr. The plants flowered from July to November, 1925.

Impatiens Garrettii *Craib* [Balsaminaceae]; inter species pedunculo communi evoluto racemis e floribus 2–3 tantum compositis, calcare elongato gracili integro, alarum lobo basali parvo distincta.

Herba annua; caulis simplex vel parce ramosus, circa 20 cm. altus, glaber vel apicem versus breviter parce pilosus. *Folia* inferiora saepissime opposita, superiora alterna, lanceolata, ovato-lanceolata, vel subovata, apice subacuminata, acuta, basi cuneata vel rotundata, ad 7·5 cm. longa et 3 cm. lata, membranacea, sicco subtus pallidiora, supra pilis brevibus crassis hic et illic instructa, subtus iuventute ad costam nervosque laterales parce breviter pilosa, mox glabra, nervis lateralibus utrinque circa 10 supra vix conspicuis subtus subprominulis, margine anguste crenata, crenis apiculatis, petiolo 4–18 mm. longo supra canaliculato et saepissime densius pilosulo aliter glabro rarius omnino glabro suffulta; glandulae infrapetiolares deficientes. *Racemi* axillares, 2–3-flori, pedunculo communi ad 2·5 cm. longo suffulti, pedicellis circa 7 mm. longis; bracteae parvae, sub anthesin persistentes. *Sepala* lateralia late ovata, apiculata, 5 mm. longa, 3·75 mm. lata; posticum (labellum) limbo 1 cm. longo ore breviter apiculato 1·3 cm. diametro, calcare gracili 3 cm. longo apice integro. *Vexillum* ovatum, 6 mm. longum, 5 mm. latum, dorso medio subalatum et

paulo infra apicem cornutum; alae inter se liberae, 2·2 cm. longae, lobo basali parvo vix 6 mm. longo, distali dimidiatim late elliptico 1 cm. lato. *Filamenta* 5 mm. longa.

Doi Angka, 1300–1675 m., *Garrett* 94.

Impatiens Kerriae *Craib* [Balsaminaceae]; caule crasso, foliis alternis *I. Parishii* Hook. f. similis, pedicellis multo longioribus distinguenda.

Herba perennis; caules ad 1 m. alti, saepissime ramosi, glabri, iuventute virides, crassi, basi tumidi, ad 4–5·5 cm. diametro, cinereo-brunnei. *Folia* alterna, lanceolata, oblongo-lanceolata, vel ovato-lanceolata, apice breviter subacuminata, costa excurrente mucronata, basi cuneata vel saepe inaequilateralia, latere altero cuneata vel rotundato-cuneata, altero cuneata vel acuminata, usque ad 13 cm. longa et 6·5 cm. lata, subcrassa, supra intense viridia, iuventute nitentia, subtus pallide viridia, glabra, nervis lateralibus utrinque circa 12 supra impressis subtus prominentibus superioribus arcuatis inferioribus arcuatis vel saepe obliquis, margine arcte anguste crenulata, crenis incurvo-apiculatis, lamina ima basi glandula solitaria columnari primo erecta mox patula utrinque instructa, petiolo ad 6 cm. longo apice lamina decurrente subalato glabro suffulta; glandulae infrapetiolares deficientes. *Pedicelli* axillares, solitarii vel saepissime tres, 7 cm. longi, patuli, glabri, virides, superne incrassati. *Sepala* 3; duo lateralia subelliptica vel rotundato-elliptica, acumine viridi fere 4 mm. longo incluso 2 cm. longa, 1·5 cm. lata, glabra, viridi-alba, costa prominente parum obliqua; posticum (labellum) cymbiforme, 1·3 cm. longum, ore oblongo-elliptico apice breviter viridi-cuspidato ad 2·2 cm. diametro, pallidum, basi rubro-venosum, calcare 5 mm. longo pallide viridi bilobato, lobis apice pallidis rotundatis saepe summo apice acuminatis, limbo adpresso. *Vexillum* elliptico-obovatum, apice emarginatum, 2·2 cm. longum, 2 cm. latum, glabrum, dorso infra apicem breviter cuspidatum et medio inferne obtuse carinatum, album vel inferne viridi-suffusum; alae inter se connatae, ad 3·8 cm. longae et latae, apice bifidae, lobo basali apice rotundato, distali 1·5 cm. longo 0·8 cm. lato apice rotundato, intra medio rubro-venosae, plus minusve luteae, margines versus pallescentes. *Filamenta* 8 mm. longa, glabra, antheris 4·5 mm. longis puberulis. *Ovarium* 9 mm. longum, viride, glabrum.

Doi Chiengdao, 1800 m., limestone rocks, *Kerr* 6544.

Plants grown from seed collected by Dr. Kerr in above locality were used for the description. The plants flowered in Aberdeen in October, 1924 and 1925.

Named in memory of Mrs. Kerr, who died in N. Siam.

Impatiens longiloba *Craib* [Balsaminaceae]; ab *I. bracteolata* Hook. f. bracteis latioribus cito deciduis, sepalis latioribus inter alia differt.

Herba ad 1 m. alta (ex *Kerr*); caulis herbaceus, stramineus, glaber vel superne glandulis paucis stipitatis instructus. *Folia*

alterna, lanceolata, ovata, vel late ovata, apice acuminata, mucronulata, basi cuneata vel acuminata, 3·5–11 cm. longa, 2–5 cm. lata, membranacea, glabra, subtus parum pallidiora, nervis lateralibus utrinque 10–12 intra marginem anastomosantibus pagina superiore conspicuis inferiore prominulis, nervis transversis supra interdum subconspicuis subtus subprominulis, margine basi excepta crenata, crenis apiculatis, inferne sparse glanduloso-ciliata, petiolo 0·3–3 cm. longo glandulis stipitatis paucis instructo suffulta; glandulae infrapetiolares saepissime binae. *Racemi* ex axillis foliorum superiorum orti, pauciflori, pedunculo communi 3–5 cm. longo suffulti, glabri; pedicelli graciles, 10–12 mm. longi; bracteae membranaceae, ovatae, mucronatae, circa 6 mm. longae, alabastra obtegentes, cito deciduae. *Sepala* 5; duo antica linearia, 5 mm. longa, 0·6 mm. lata; duo lateralia late oblique ovata, mucronata, 5·5 mm. longa, 4 mm. lata; posticum (labellum) calcare incluso 3·3 cm. longum, ore apiculato 8 mm. diametro, glabrum. *Vexillum* 1 cm. longum, paulo ultra 1 cm. latum, dorso medio carinatum; alae inter se liberae, circa 3 cm. longae, lobo basali oblongo apice rotundato 5 mm. longo 4·5 mm. lato, distali lineari 20 mm. longo 4 mm. lato. *Ovarium* glabrum. *Semina* pilis spiralibus tecta.

Doi Angka, 1800-2125 m., *Garrett* 72 (*type*), *Kerr* 6298.

Impatiens muscicola *Craib* [Balsaminaceae]; herba nana, erecta, foliis alternis, floribus axillaribus parvis ecalcaratis distincta.

Herba pusilla, caule erecto ad 11 cm. alto simplice vel saepissime pauci-ramoso glabro sicco rubescente. *Folia* alterna, lanceolato-ovata, rarius subovata, apice costa excurrente apiculata, basi cuneata vel rotundato-cuneata, 7–15 mm. longa, 3·5–7 mm. lata, membranacea, supra pilis paucis instructa, subtus pallidiora, glabra, nervis lateralibus utrinque 3–4 supra fere obscuris subtus subconspicuis, margine pauci-denticulata, ciliata, basi eglandulosa, petiolo 1–3 mm. longo suffulta. *Flores* axillares, solitarii, pedicellis gracilibus circa 6 mm. longis unilateraliter breviter pilosis suffulti; alabastra pilis paucis sat longis transverse septatis instructa. *Sepala* lateralia angusta, vix 0·75 mm. longa, parce pilosa, postico vexillo simili ecalcarato. *Vexillum* oblongo-ellipticum, acute acuminatum, 2·25 mm. longum, 1·5 mm. latum, dorso pauci-pilosum; alae 2·5 mm. longae, 1·5 mm. latae, lobo basali oblongo-rotundato 0·75 mm. longo. *Filamenta* 1·5 mm. longa, gracilia. *Capsula* vix matura fusiformis, acuminata, breviter sparse pilosa.

Doi Chiengdao, 2100 m., on mossy rocks, flowers pale pink, *Kerr* 6608.

Impatiens Noei *Craib* [Balsaminaceae]; ab *I. Aureliana* Hook. f. vexillo pro rata longiore, alarum lobis distalibus basalibus maioribus, seminibus haud glabris recedit.

Herba annua; caules erecti, 20–30 cm. alti, graciles, simplices

vel saepissime ramosi, iuventute parce breviter ferrugineo-hirsuto-pubescentes, cito plus minusve glabrescentes, demum glabri. *Folia* alterna, lanceolata, apice acuta, saepe subacuminata, basi cuneata vel longius acuminato-attenuata, ad 4·5 cm. longa et 1·5 cm. lata, chartacea vel membranaceo-chartacea, pagina superiore viridia, inferiore pallidiora, utraque breviter pubescentia, nervis lateralibus utrinque circa 8 subtus conspicuis supra obscuris vel subconspicuis, nervulis obscuris vel paucis subtus subconspicuis, margine distanter denticulata, inferne saepissime glandulis stipitatis paucis utrinque instructa, petiolo ad 2 cm. longo primo parce breviter pubescente suffulta; glandulae infrapetiolares haud evolutae. *Flores* axillares, gemini, pedicellis gracilibus 1·8–2 cm. longis basi parvibracteatis suffulti; alabastra sparse pubescentia. *Sepala* 3; duo lateralia lineari-lanceolata, acuta, 2 mm. longa; posticum (labellum) limbo 3 mm. longo apice ad 5 mm. diametro breviter apiculato, calcare curvato 1·3 cm. longo integro, sparse pubescens. *Vexillum* obovatum, apice retusum, mucronatum, 5·5 mm. longum, 4·5 mm. latum, dorso breviter sparse pubescens et medio longitudinaliter carinatum; alae inter se liberae, 8 mm. longae, lobo basali oblongo apice rotundato 4 mm. longo 1·75 mm. lato, distali 5 mm. longo medio 3 mm lato. *Filamenta* 2·5 mm. longa. *Ovarium* 2 mm. longum, adpresse pubescens. *Capsula* fusiformis, 1 cm. longa, pilis pallide ferrugineis crassiusculis tecta, seminibus pilis spiralibus tectis.

Saraburi, Muak Lek, Kao Mak Kok, *Noe* 128.

Impatiens opinata *Craib* [Balsaminaceae] ; ab affini *I. mirabili* Hook. f. floribus minoribus inter alia differt.

Caulis carnosus, basi tuberosus, 10–25 cm. altus, sicco substramineus. *Folia* alterna, ad caulis apicem aggregata, elliptica vel ovato-elliptica, apice breviter acuminata, mucronata, basi acuminata, 6–16·5 cm. longa, 4·5–10 cm. lata, membranacea, sicco plus minusve fuscescentia, glabra, nervis lateralibus utrinque 4–7 intra marginem prorsus curvatis pagina utraque conspicuis vel subconspicuis, margine distanter serrulata, petiolo 4–7·5 cm. longo glabro suffulta; glandulae infrapetiolares deficientes. *Racemi* solitarii, terminales, folia superantes, pedunculo communi 8–13 cm. longo infra flores bracteas duas foliaceas parvas gerente suffulti; flores lutei (ex *Kerr*); bracteae sub anthesin persistentes, circa 3·5 mm. longae; pedicelli 7 mm. longi, glabri. *Sepala* 5; duo antica linearia, acuta, 7 mm. longa, 1·3 mm. lata; duo lateralia oblique oblongo-elliptica, apiculata, 8 mm. longa, 5 mm. lata; posticum (labellum) limbo 1·3 cm. longo ore apiculato 1·2 cm. diametro, calcare apice integro obtuso 1·3 cm. longo. *Vexillum* transverse ellipticum, 7 mm. longum, 7·75 mm. latum, dorso medio tantum carinatum; alae inter se connatae, vix 2 cm. longae, inferne 2·4 cm. latae, lobo basali rotundato, distali anguste oblongo 10 mm. longo 4·5 mm. lato. *Ovarium* glabrum.

Pattani, Banang Sta, 50–300 m., crevices of limestone rocks, evergreen forest, *Kerr* 7304.

Impatiens patula *Craib* [Balsaminaceae]; ab affini *I. violiflora* Hook. f. calcare longiore, alarum lobis et basalibus et distalibus longioribus angustioribus recedit.

Herba annua; caulis erectus, ad 38 cm. altus, inferne nudus, simplex vel saepissime medio parce breviter ramosus, primo parce pilosus, mox glaber, sicco brunnescens. *Folia* inferiora decidua, superiora alterna, lanceolata vel lineari-lanceolata, apice costa excurrente mucronata, basi attenuato-cuneata, 3·5–7 cm. longa, 0·8–1·3 cm. lata, chartacea, pagina superiore pilis subcrassis transverse septatis sparsis inferiore pilis brevioribus ad costam nervosque laterales instructa, subtus pallidiora, nervis lateralibus utrinque 6–8 pagina superiore vix conspicuis inferiore conspicuis, nervulis pagina utraque obscuris vel inferiore paucis subconspicuis, margine distanter denticulata, petiolo 0·5–2 cm. longo primo parce piloso mox glabro suffulta; glandulae infrapetiolares deficientes. *Pedicelli* axillares, graciles, ad 3 cm. longi, parce pilosi; flores violacei (ex *Kerr*). *Sepala* 3; duo lateralia linearisubulata, 3 mm. longa; posticum (labellum) limbo 5 mm. longo ore ad 7 mm. diametro apiculato parce pubescente, calcare gracili 3·2 cm. longo glabro integro. *Vexillum* subquadratum, apice emarginatum, 12 mm. longum, 13 mm. latum, glabrum, dorso infra apicem cornutum, haud medio carinatum; alae inter se liberae, 18·5 mm. longae, lobo basali patulo anguste oblongo 11 mm. longo 4·5 mm. lato apice retuso, distali 14 mm. longo medio 8 mm. lato supra medium subitius angustato parte triente apicali lineari. *Ovarium* 3·5 mm. longum, breviter pubescens.

Kampêngpet, Kao Hua Mot, 800 m., open grassy forest, *Kerr* 6128.

Impatiens saxicola *Craib* [Balsaminaceae]; herba nana, foliis parvis, floribus axillaribus solitariis parvis vix calcaratis cognoscenda.

Caules circa 20 cm. alti, nodis inferioribus radicantes, straminei, glabri vel iuventute pilis paucis brevibus instructi, inferne ramosi. *Folia* alterna, lanceolata, apice acuminata vel subacuminata, costa excurrente apiculata, basi cuneata vel acuminato-cuneata, ad 3·5 cm. longa et 1·1 cm. lata, membranacea, supra pilis paucis instructa, subtus glabra, nervis lateralibus utrinque circa 6 obscuris, margine crenata vel serrulato-crenata crenis apiculatis, basi utrinque pauciciliata, petiolo 3–10 mm. longo suffulta. *Flores* axillares, solitarii, pedicellis gracilibus circa 1·5 cm. longis basi bracteatis suffulti. *Sepala* 3, oblongo-lanceolata, acuta, 2 mm. longa et 0·8 mm. lata, postico basi saccato vix calcarato. *Vexillum* rotundato-oblatum, acute acuminatum, 3·5 mm. longum, 4 mm. latum, medio incrassatum, aliter membranaceum, dorso obtuse carinatum; alae 7·5 mm. longae, lobo basali 2·5 mm. longo 2 mm. lato, distali obtuso supra medium 2 mm. latum angustato. *Filamenta* ad 2·5 mm. longa, inferne gracilia, superne ampliata. *Ovarium* sulcatum, circa 2 mm. altum, parce setulosum.

Kaw Chang, Lêm Dan Kao, 400 m., on open rocks, flowers pale mauve, with yellow spots at base of lip, *Kerr* 9303.

Impatiens subaequalis *Craib* [Balsaminaceae]; ab *I. violiflora* Hook. f. alarum lobis basalibus pro rata maioribus, ab *I. Aureliana* Hook. f. sepalis maioribus, vexillo aequilongo et lato, ab ambabus floribus multo minoribus recedit.

Herba annua; caulis inferne radicans, 20–30 cm. altus, parte dimidia superiore saepissime simplice, inferiore ramosa, ramulis infimis oppositis, glaber, sicco stramineus. *Folia* inferiora opposita, superiora alterna, lanceolata vel ovata, apice acuminata, mucronulata, basi cuneata vel late cuneata, 3–8 cm. longa, 1·7–2·5 cm. lata, membranacea, supra pilis albis transverse septatis sparse instructa, sicco viridia, subtus ad costam nervosque laterales pilis paucis brevibus instructa, parum pallidiora, nervis lateralibus utrinque 8–10 supra subconspicuis subtus prominulis, nervis transversis paucis subtus conspicuis, margine distanter serrulata, petiolo ad 6 mm. longo parce pubescente suffulta; glandulae infrapetiolares saepissime evolutae, paucae, parvae. *Pedicelli* axillares, sub anthesin 1·5 cm. longi, infructescentes 2 cm. longi, pilis paucis adpressis instructi; flores punicei (ex *Kerr*). *Sepala* 3; duo lateralia oblongo-lanceolata, acuta, 2·5 mm. longa, ciliata, nervosa; posticum (labellum) parce pubescens, limbo 3·75 mm. longo apice ad 5·5 mm. diametro, calcare 12 mm. longo integro. *Vexillum* elliptico-obovatum, apice parum retusum, 5·5 mm. longum, 5 mm. latum, dorso medio longitudinaliter carinatum, carina in mucronem rectum 1 mm. longum excurrente, glabrum; alae inter se liberae, 9 mm. longae, lobo basali quadrato 4 mm. longo et lato, distali oblongo apice retuso 5 mm. longo 3 mm. lato. *Ovarium* parce pubescens, 2·5 mm. longum. *Capsula* ad 13 mm. longa, medio 5 mm. lata, apice basique angustata, breviter crassius pilosa.

Chantabun, Kao Soi Dao, 1200 m., on rocks in evergreen forest, *Kerr* 9626.

Zanthoxylum Collinsae *Craib* [Rutaceae-Zanthoxyleae]; ab affini *Z. nitido* DC. foliolorum nervis lateralibus paucioribus supra impressis subtus prominentibus facile distinguendum.

Frutex scandens; ramuli primo puberuli, mox glabrescentes, cortice brunneo vel fusco-brunneo obtecti, lenticellis parvis prominulis vix conspicuis, spinis brevibus deflexis sat numerosis armati. *Folia* alterna, pinnatim 3–7-foliolata, petiolo 5-8 cm. longo incluso 15–33 cm. longa, petiolo basi terete superne cum rhachi anguste canaliculato, et petiolo et rhachi spinis deflexis armatis et puberulis; foliola opposita, oblonga vel elliptica, apice caudato-acuminata, basi inaequilateralia, rotundata, saepissime etiam cordatula, usque ad 12 cm. longa et 5·8 cm. lata, chartaceo-coriacea, iuventute pagina utraque puberula, matura inferiore puberula, superiore glabra vel interdum inferne sparse puberula, nervis lateralibus utrinque 10–12 aliis intermediis parallelis saepe

minus tantum prominentibus additus rectis bene intra marginem anastomosantibus supra impressis subtus prominentibus, nervulis rete utrinque prominulum efficientibus, lateralia petiolulo circa 3 mm. longo puberulo supra canaliculato, terminalia petiolulo ad 4·5 cm. longo suffulta. *Flores* masculi in paniculas axillares e basi ramosas 3–5 cm. longas dispositi, ramulis inferne nudis, cymis ultimis sessilibus vel inferioribus pedunculo ad 3 mm. longo suffultis, pedicellis et bracteis 1–2 mm. longis, partibus omnibus puberulis sicco fuscis. *Sepala* sat crassa, deltoidea, obtusa, circa 1 mm. longa, extra puberula, intra glabra. *Petala* 4–5, oblongo-ovata, apice acumine incurvo instructa, 2·25 mm. longa, 1·5 mm. lata, extra puberula, intra glabra. *Stamina* 4–5, glabra, filamentis 3 mm. longis, antheris 1 mm. longis breviter apiculatis. *Discus* brevis, glaber. *Pistillodium* glabrum, circa 1·5 mm. altum.

Sriracha, Tapibut, 150 m., *Mrs. D. J. Collins* 705 (*type*). Sriracha, Nawng Kaw, 50–70 m., evergreen forest, *Kerr* 6795, *Marcan* 1184.

Dalbergia abbreviata *Craib* [Leguminosae-Dalbergieae]; ab affini *D. Pierreana* Prain foliolis maioribus recedit.

Frutex volubilis; ramuli primo densius pubescentes, mox glabri, cortice fusco-brunneo vel rubro-brunneo lenticellato obtecti. *Folia* 15–19-foliolata, ad 15 cm. longa, petiolo communi 10–15 mm. longo cum rhachi densius pubescente suffulta; stipulae fugaces; foliola oblonga vel lanceolato-oblonga, apice rotundata vel obtusa, interdum apiculata, basi inferiora rotundata, superiora rotundato-cuneata vel cuneata, circa 4 cm. longa et 1·5 cm. lata, chartacea, pagina utraque viridia, inferiore parum pallidiora, utraque primo sericea, mox pilis adpressis subsparse tecta, nervis lateralibus utrinque circa 8 intra marginem anastomosantibus obscuris, petiolulis 2–3 mm. longis dense pubescentibus suffulta. *Paniculae* et e parte inferiore efoliata ramulorum hornitinorum et e tuberculis in ramulis vetustioribus ortae, dense pubescentes vel subtomentosae, 3–4 cm. (pedunculo communi circa 1·5 cm. longo incluso) longae; pedicelli circa 2 mm. longi; bracteae oblongo-ellipticae, 2 mm. longae, persistentes; bracteolae 2, circa 1·5 mm. longae, ad calycis basem positae, sub anthesin persistentes. *Calyx* extra adpresse ferrugineo-pubescens, intra superne parce pubescens, basi pilosus; tubus 2·5 mm. longus; lobus anticus paululo ultra 1 mm. longus, lateralibus subaequalis; lobi postici late deltoidei, 1 mm. longi, basi 2 mm. lati, aliis multo latiores. *Vexillum* refractum, limbo subrotundato circa 3 mm. diametro intra medio parce piloso dorso basi medio pilis paucis instructo; stipes 2 mm. longus, utrinque superne pilis paucis instructus; alae 3·5 mm. longae, 1·75 mm. latae, basi latere altero cuneatae, altero cordatae; carina 3 mm. longa, 2·3 mm. lata, basi subtruncata, stipite 2·3 mm. longo suffulta. *Stamina* monadelpha, tubo intra inferne piloso. *Ovarium* vix 3 mm. altum, sutura ventrali adpresse pilosum, stipite circa 1·5 mm. longo piloso suffultum, stylo subulato 1·5 mm. longo, ovulis 2. *Legumen* samaroideum, ligulatum vel late ligulatum,

4–7 cm. longum, 1·4 cm. latum, glabrum vel sutura pilis brevibus hic et illic instructum, reticulatum, sutura dorsali anguste alatum, stipite circa 5 mm. longo suffultum; semina 1–2.

Doi Sutep, 700–950 m., *Kerr* 3554 (*type*), 1773, 3554A.

Quisqualis prostrata *Craib* [Combretaceae-Combreteae]; a speciebus aliis ramis prostratis, a *Q. densiflora* var. *parvifolia* Ridl. foliis haud acuminatis, alabastris minus pubescentibus recedit.

Fruticulus ramulis sterilibus prostratis ad 60 cm. longis crispatim puberulis vel breviter pubescentibus teretibus. *Folia* opposita vel subopposita, ovata vel subelliptica, apice emarginata, subtruncata, vel obtusa, costa excurrente breviter apiculata, basi rotundata vel cordata, 3·5–6·5 cm. longa, 2–4 cm. lata, chartacea, sicco viridia, utrinque pustulata, supra ad costam puberula, subtus pilis paucis ad costam nervosque laterales instructa et saepe ad nervorum axillos pilosa, nervis lateralibus utrinque 5–7 intra marginem anastomosantibus supra conspicuis interdum impressis subtus prominentibus, nervulis supra conspicuis vel subprominulis subtus subprominulis, margine integra, saepe recurva, ciliolata; petiolus 2–3 mm. longus, breviter crispatim pubescens. *Racemi* breves, ramulos laterales circa 8 cm. longos terminantes; flores subvirides vel albidi, mox punicei (ex *Kerr*); bracteae lanceolatae, acuminatae, ovaria superantes, deciduae vel rarius diutius persistentes. *Receptaculi* tubus 11 mm. longus, extra parce pilosus, intra pilis paucis instructus. *Sepala* 5, e basi deltoidea subulato-acuminata, 2 mm. longa, basi 0·75 mm. lata, dorso pilis paucis sat longis instructa, intra glabra, ciliata. *Petala* 5, linearia vel spatulato-linearia, obtusa, 3·75 mm. longa, 1 mm. lata, utrinque puberula, ciliata. *Stamina* sub-biseriata, petalis breviora. *Ovarium* 3 mm. altum, pubescens, 5–angulare, ovulis 2–3 pendulis, funiculis elongatis; stylus petalis brevior, receptaculi tubo adnatus.

Utaradit, 100 m., trailing on open grassy ground, *Kerr* 5891 (*type*). Supanburi, Ban Nang Buat, 20 m., open scrub, *Kerr* 6994. Saraburi, Mênam Sak, 20 m., limestone rocks, *Kerr* 6994a.

Rhodamnia siamensis *Craib* [Myrtaceae-Myrteae]; a *R. cinerea* Jack, pedunculis ubi evolutis et pedicellis petiolis conspicue longioribus, floribus maioribus, petalis dorso sericeis recedit.

Frutex 10–15-pedalis (ex *collectoribus*); ramuli iuventute sericei, mox glabrescentes, cortice brunneo longitudinaliter fisso tecti. *Folia* lanceolata vel oblongo-elliptica, apice acuminata, acuta, basi cuneata, ad 7·5 cm. longa et 2·8 cm. lata, chartacea vel coriaceo-chartacea, supra iuventute sericea, cito glabrescentia, demum fere glabra, subtus sericea, e basi trinervia, nervis lateralibus fere ad imum apicem currentibus, costa etiam saepe nervis duobus lateralibus supra impressis, tribus subtus prominentibus, nervis secondariis (e costa ortis) numerosis inter se parallelis plus minusve reticulatis supra conspicuis parum elevatis subtus paucis saepe conspicuis, petiolo circa 5 mm. longo supra canaliculato

indumento ei ramulorum simili obtecto suffulta. *Flores* axillares, vel pedunculo communi evoluto vel pedicellis fasciculatis, et pedunculo et pedicellis petiolo duplo longioribus indumento ei ramulorum simili obtectis; bracteolae duae, circa 1·5 mm. longae, ad pedicelli apicem positae, receptaculo adpressae. *Receptaculum* sericeum, circa 2·5 mm. longum. *Calyx* 2·5–3·5 mm. longus, lobis inter se vix aequalibus oblongis apice rotundatis extra sericeis intra superne pilis paucis adpressis instructis. *Petala* oblongo-obovata, apice rotundata, basem versus angustata, circa 8 mm. longa et 4 mm. lata, extra sericea, intra glabra, ciliata. *Stamina* petalis paululo breviora, glabra. *Stylus* petalis paululo longior, superne gradatim angustatus. *Fructus* plus minusve globosus, circa 8 mm. diametro, subsericeus, calyce persistente vel deciduo.

Nawng Yai Bu, 15 m., scrub jungle, *Kerr* 2147 (*type*), *Mrs. D. J. Collins* 730. Sriracha, 5–12 m., *Mrs. D. J. Collins* 193, *Kerr* 4233. Petchaburi, 6 m., *Mrs. D. J. Collins* 595. Hua Hin, near beach, 2 m., *Marcan* 342. Prachuap, Bangtapan, evergreen forest on coast, 10 m., *Winit* 508. Kaw Pangan, *Robinson*. Chantabun, Lem Sing, sea-shore, *Marcan* 1346.

var. **latifolia** *Craib*, a typa foliis elliptico-ovatis basi rotundatis vel truncato-rotundatis ad 8·3 cm. longis et 4·5 cm. latis, bracteolis fere duplo longioribus, corolla ad 1 cm. longa distinguenda.

Nawng Kaw, edge of clearing in evergreen jungle, 30 m., *Kerr* 2051.

The true *R. cinerea* Jack (*R. trinervia* Blume), so far as our specimens go here, does not seem to occur in Siam except in the extreme south, where it has been collected on both sides of the Peninsula (in Satul by Ridley and in Pattani by Kerr!). M. Gagnepain, who elaborated the Myrtaceae in Fl. Gen. Indo-Chine, refers a Petchaburi plant to *R. trinervia*, but the description in this flora suggests that it has been based, at least in part, on the plant now described as *R. siamensis*. It is possible therefore that the Petchaburi plant may be referable rather to the latter species which has been collected at Petchaburi as well as a little to the north and to the south of that district.

The latest author (so far as I can trace) to deal with this plant was Ridley in his Flora of the Malay Peninsula, where the Kaw Pangan plant is referred to but left unnamed.

Didymocarpus bicolor *Craib* [Gesneraceae-Cyrtandreae]; inter species caule evoluto et floribus paniculatis corollae labio antico pallide viridi bene distincta.

Caulis erectus, simplex vel e basi pauci-ramosus, circa 5 cm. altus, viridis, pilis divergentibus albis longiusculis et brevioribus glanduloso-capitatis tectus. *Folia* superiora opposita, inferiora subopposita vel alterna, ovata, late ovata, vel oblongo-ovata, apice obtusa, basi rotundata vel subtruncata, saltem inferiora inaequilateralia, usque ad 7 cm. longa et 5·5 cm. lata, supra viridia, subtus pallide viridia, supra molliter pubescentia, subtus ad costam

nervosque laterales pubescentia, nervis lateralibus utrinque 5–7 supra parum impressis subtus prominentibus, nervulis supra fere obsoletis subtus paucis subprominulis, margine crenulato-serrata, ciliata, petiolo 1–3 cm. longo supra plus minusve canaliculato indumento ei caulis simili tecto suffulta. *Inflorescentia* ex axillis superioribus orta, pedunculo communi ad 5·5 cm. longo apice bracteis duabus viridibus saepe basi rubro-tinctis late ovatis circa 6 mm. longis glabris vel pilis longiusculis glanduloso-capitatis plus minusve ciliatis pilis longiusculis albis divergentibus glanduloso-capitatis subsparse instructo suffulta; pedunculus cyman gerens vel saepissime iterum cymosim furcatus, pedunculis partialibus ad 1·5 cm. longis inferne glabris superne pedunculo communi similiter tectis, pedicellis terminalibus circa 1 cm. longis glabris vel apice pauci-pilosis viridibus vel saepissime rubro-tinctis; alabastra glabra, extra nitida, vinosa, apice viridia, 5-umbilicata. *Sepala* inter se libera, subviridia, apice rubra, lineari-lanceolata, obtusa, 3–3·5 mm. longa, 1–1·5 mm. lata, duobus anticis aliis paulo maioribus, glabra. *Corollae* glabrae tubus vix 2 cm. longus, basi circa 4 mm. diametro, paulo lateraliter compressus, subrectus; labium anticum pallide viride, 8·5 mm. longum, 10 mm. latum, 3-lobatum, lobis transverse oblongis apice truncatis vel rotundato-truncatis ad 3·5 mm. longis et 6 mm. latis, posticum bifidum, segmentis circa 2 mm. longis et 2·5 mm. latis subquadratis apice rotundatis vel subtruncatis. *Stamina* 2, antica, filamentis pallidis circa 4 mm. longis, antheris inter se cohaerentibus puberulis corollae faucem vix attingentibus; staminodia columnaria, pallida, ad 1 mm. longa, interdum minuta vel haud evoluta. *Pistillum* 18 mm. altum, basi disco 1·5 mm. alto cinctum, stipite glabro, ovario inferne rubro-suffuso superne pallide viridi cum stylo pallide viridi pilis brevibus glanduloso-capitatis subsparse tecto, stigmate viridi papilloso obsolete 2-lobulato.

Pu Tong, 1000–1200 m., *Kerr*.

Roots and seed collected in above locality were forwarded by Dr. Kerr. The plants flowered in Aberdeen in 1924 and the description has been drawn up from the living material.

Didymocarpus insulsa *Craib* [Gesneraceae-Cyrtandreae]; a *D. bicolore* Craib corollae labiis colore tubo similibus inter alia recedit.

Caules pauci, erecti, 7–13 cm. alti, inferne mox brunnescentes, superne ad nodos brunnescentes, aliter virides, teretes. *Folia* interdum alterna, saepissime 3-pseudoverticillata, oblonga, oblongo-ovata, vel rarius oblongo-obovata, apice obtusa, basi inaequilateralia, latere altero rotundato altero rotundato-cuneata, 5–10 cm. longa, 3–5·5 cm. lata, sat rigida, supra viridia, subtus pallidiora, pagina superiore squamis ferrugineis cruciatim capitatis et pilis brevibus albis sparsis, inferiore squamis similibus instructa, nervis lateralibus utrinque 5–7 supra conspicuis subtus prominentibus, nervulis vix conspicuis, margine crenato-serrata, petiolo ad 2 cm. longo supra conspicue canaliculato inferne brunneo-tincto suffulta.

Cymae axillares, pedunculo communi circa 4 cm. longo incluso ad 9 cm. longae, 8 cm. latae, pedunculo communi squamulis ferrugineis plus minusve sparse tecto, apice bracteis duabus foliaceis ovatis viridibus ad 6 mm. longis sessilibus instructo, pedunculis partialibus circa 17 mm. longis pilis sat longis glanduloso-capitatis albis instructis apice 2-bracteatis iterum ramosis, pedunculis ultimis brevioribus, pedicellis ad 11 mm. longis, pilis capitatis similibus tectis. *Sepala* 5, cito recurva, plus minusve rubro-tincta, lineari-lanceolata vel lanceolata, obtusa, ad 3 mm. longa, extra squamulis ferrugineis tecta, intra glabra. *Corollae* lilacineae vel iuventute apice purpureae tubus omnino glaber, rectus, 15 mm. longus, parte dimidia inferiore 3 mm. diametro, superne inflatus et parum lateraliter compressus; labium inferum 3-lobatum, lobis late oblongis vel rotundato-oblongis apice rotundatis ad 6 mm. diametro, superum 2-lobatum, lobis parum reflexis rotundatis ad 3 mm. longis et 4·5 mm. latis. *Stamina* fertilia 2, filamentis albis superne pilis paucis albis brevibus glanduloso-capitatis instructis 5 mm. longis 1 cm. supra corollae tubi basem inserta, staminodiis 3 parvis albis glabris, antheris coalitis apice et basi breviter albo-barbatis. *Discus* brevis, vix 2 mm. longus, ovarii basem cingens. *Pistillum* 1·75 cm. longum, paulo exsertum, stigmate viridi excepto album, glabrum; stigma breviter papillosum, ambitu rotundato-oblongum, centro concavum.

Plants raised from seed received from Dr. A. F. G. Kerr flowered at Aberdeen in October 1925 (Herb. Kew.). On these the description is based.

Didymocarpus tristis *Craib* [Gesneraceae-Cyrtandreae]; ab affini *D. insulsa* Craib caule breviore, foliis latioribus basi cordatis, calyce et corolla paulo maioribus, sepalis haud semper patulis recedit.

Caulis erectus, vix 2 cm. altus, viridis, ad nodos rubro-brunneus, pilis albis brevibus adpressis sparse instructus et conspicue aureo-squamulosus. *Folia* opposita, oblonga, oblongo-ovata, vel late ovata, apice obtusa, basi altius cordata vel iuvenilia suborbicularia et apice breviter acuminata, parum inaequilateralia, matura 6–10 cm. longa et 4–7·5 cm. lata, supra viridia, pilis albis sat rigidis subadpressis sparse tecta, subtus pallide viridia, pilis paucis albis brevibus ad costam nervosque laterales et marginem versus instructa, praetereaque pagina utraque squamulis parvis aureis ornata, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominentibus, nervulis obscuris, margine serrulata vel crenulato-serrulata, petiolo ad 4 cm. longo supra canaliculato viridi vel plus minusve rubescente indumento ei caulis simili tecto suffulta. *Cymae* axillares, folia aequantes vel paulo superantes, pedunculo communi 8 cm. longo squamulis aureis ornato inferne subglabro superne pilis paucis brevibus albis hic et illic et longioribus glanduloso-capitatis sparsissime instructo apice bracteis duabus circa 2 mm. longis ornato suffultae; pedunculi partiales 2–2·5 cm. longi, plus minusve rubescentes, pilis elongatis glanduloso-capitatis et squamulis aureis

sparse instructi, apice bibracteati; pedicelli 1–1·3 cm. longi, indumento ei pedunculorum partialium simili sed pilis praesertim apicem versus magis numerosis instructi et squamulis saepe deficientibus. *Sepala* linearia, apice obtusa, parum incrassata, glabra vel dorso superne interdum pilis paucis instructa, 4·5–6 mm. longa, 1–1·25 mm. lata, sub anthesin patula vel obliquo-patula, mox corollae adpressa, dein parum reflexa. *Corollae* pendulae glabrae tubus 2·4 cm. longus, inferne 3·5 mm., apice 5·5 mm. diametro; labium anticum 1 cm. longum, 1·5 cm. latum, 3-lobatum, lobis subro, tundatis 6–7 mm. diametro, posticum 2-lobatum, lobis 2·5 mm-longis 5 mm. latis rotundatis. *Stamina* duo antica fertilia. filamentis 5 mm. longis glabris, antheris circa 1·5 mm. longis apice et basi barbatis; staminodia 3, parva, glabra. *Discus* 3 mm. altus, ruber vel purpureo-ruber, apice basique viridis, ore obliquus, saepe plus minusve denticulatus. *Ovarium* stipite incluso 1·8 cm. longum, glabrum, rubrum, stylo 4 mm. longo glabro albo, stigmate obliquo apice concavo.

Kao Soi Dao, 1400 m., on rocks, *Kerr*.

Described from plants grown at Aberdeen from seed collected by Dr. Kerr in above locality. The plants flowered for the first time in October, 1925.

Chirita Marcanii *Craib* [Gesneraceae-Cyrtandreae]; a *C. tubulosa* Craib corolla intense aurantiaca facile distinguenda.

Herba, ut videtur, annua; caulis sub anthesin circa 24 cm. altus, inferne subpurpurascens, superne viridis, basi circa 1 cm. diametro, pilis rigidis albis subreflexis inferne sparsius superne densius instructus. *Folia* opposita, ovato-oblonga, apice obtusa, basi cordata, ad 19 cm. longa et 12 cm. lata, supra viridia subtus pallide viridia, pagina superiore pilis erectis albis sat rigidis subhirsuta, inferiore ad costam nervosque laterales similiter subhirsuta, aliter sparse pubescentia, nervis lateralibus utrinque usque ad 22 supra parum impressis subtus prominentibus, margine ciliata, petiolo sat robusto ad 20 mm. longo suffulta. *Pedunculus* communis basi petiolo adnatus; pedunculi partiales biflori, circa 2 cm. longi, indumento ei caulium simili tecti, pedicellis ad 2·5 cm. longis similiter tectis. *Sepala* 5, viridia, imbricata, recta vel post anthesin apice parum recurva, dorso pilis sat longis transverse septatis tecta, ciliata, intra superne parce pubescentia, lanceolata, circa 2·5 cm. longa et 0·5 cm. lata, post anthesin ad 1 cm. lata. *Corolla* intense aurantiaca, basi excepta extra pilis transverse septatis glanduloso-capitatis densius instructa; tubus fere 3·5 cm. longus, basi pallidus, 1 cm. supra basem defractus, dein per 1 cm. gradatim ampliatus, dein subitius inflatus, apice 12 mm. diametro; lobus infimus subplanus, 12 mm. longus et 15 mm. latus, aliis paulo minoribus et parum reflexis. *Stamina* 2, antheris connatis barbatis, filamentis superne incrassatis. *Ovarium* viride, basi disco brevi pallido cinctum, inferne glabrum, superne pubescens, 12 mm. longum, stylo 25 mm. longo inferne pubescente superne glabro, stigmate bilamellato papilloso.

Muak Lek, limestone rocks, *Marcan* 1872.

Plants raised from seed of the above collection flowered at Aberdeen in 1925 and formed the basis of the description.

Boea Harroviana *Craib* [Gesneraceae-Cyrtandreae]; a *B. Kerrii* Craib foliis saepe ternatis basi rotundatis cordatulis facile distinguenda.

Caulis erectus, simplex, brevis vel ad 5 cm. altus, obtuse angulatus, arachnoideus, internodiis brevibus vel ad 3 cm. longis. *Folia* saepe ternata, ovata vel oblongo-ovata, apice obtusa, basi rotundata, cordatula, inaequilateralia, ad 8 cm. longa et 5 cm. lata, coriacea, supra viridia, laxe arachnoidea vel demum fere glabra, subtus subcinnamomea, dense arachnoidea, costa subtus valde prominente, nervis lateralibus utrinque 7–8 supra conspicuis subtus prominentibus, nervulis inconspicuis, margine crenulato-serrata, petiolo 3–6·5 cm. longo supra superne canaliculato pallide cinnamomeo-arachnoideo suffulta. *Pedunculi* communes axillares, 8–16 cm. longi, apice cymosim ramosi; pedunculi partiales ad 4 cm. longi; pedunculi ultimi circa 1·5 cm. longi; pedicelli ad 8 mm. longi, pedunculis et pedicellis arachnoideis; bracteae infimae foliaceae, ad 13 mm. longae et 5 mm. latae, superiores gradatim minores; flores pallidi. *Calyx* 4 mm. longus, sub-bilabiatus, extra arachnoideus, intra glaber. *Corolla* glabra, apice ad 1·4 cm. diametro; tubus antice 7 mm., postice 5 mm. longus; labium anticum 3–lobatum, lobis rotundatis fere 6 mm. diametro, posticum 2-lobatum, lobis brevibus apice rotundatis. *Stamina* 2, filamentis viridibus puberulis 2·5 mm. longis, antheris apice connatis 3 mm. longis pallidis apice brunnescentibus poro apicali dehiscentibus; staminodia 3, filiformia, parva. *Pistillum* circa 1 cm. longum, ovario glabro, stylo exserto puberulo, stigmate obliquo papilloso.

Mê Ping Rapids, Kêng Soi, 350 m., common on rocks, flowers pale mauve, *Kerr* 4629.

Thunbergia nivea *Craib* [Acanthaceae-Thunbergieae]; species nova caulibus brevibus, floribus magnis niveis cognoscenda.

Caules erecti, 12–40 cm. alti, vel volubiles, basi lignosi, iuventute densius hirsuto-pilosi, basem versus fusci et puberuli. *Folia* subovata, ovato-lanceolata, vel lanceolata, rarius oblongo-elliptica, superiora apiculata, inferiora obtusa, rarius rotundata, basi rotundata vel cordatula, ad 8·5 cm. longa et 4·5 cm. lata, sicco rigida, supra hirsuta, demum scabrida, subtus pallidiora, pilosa, e basi 5-nervia, nervis supra conspicuis saepe impressis subtus prominentibus, nervis secondariis (e costa ortis) utrinque circa 5 demum supra impressis subtus prominentibus, nervulis demum supra impressis subtus prominulis, margine subintegra vel saepissime irregulariter pauci-dentata vel lobulata, petiolo ad 1·4 cm. longo dense hirsuto-piloso supra canaliculato suffulta. *Pedicelli* axillares, solitarii vel gemini, 3–5 cm. longi, pilis divergentibus tenuibus tecti, virides, basi rubro-suffusi; bracteolae 2, sub anthesin virides, mox pallescentes, inter se liberae, ovatae vel late ovatae, basi late

cordatae, obtuse apiculatae, ad 2 cm. longae et 1·4 cm. latae, e basi 5-nerviae, nervis extra prominentibus intra impressis, dorso pilosae, intra glabrae, ciliatae, sessiles. *Calyx* 2·5–3·5 mm. longus, puberulus, vix ad medium 8-lobatus, lobis saepe irregulariter iterum lobulatis. *Corollae* albae oculo pallide luteo-viridis tubus vix 3 cm. longus, lateraliter compressus, apice constrictus, extra pubescens, intra inferne ad filamentorum insertionem pilosus, aliter glaber, limbus 5 cm. diametro, 5-lobatus, lobis cuneatis apice ad 2·3 cm. latis dorso inferne pubescentibus hic et illic ciliatis. *Stamina* 4; filamenta 2·5–6 mm. longa, 5 mm. supra corollae basem inserta, glabra; antherae inter se liberae, sagittatae, circa 3·5 mm. longae, glabrae. *Ovarium* viride, calycem paulo superans, hic et illic pilis paucis instructum vel subglabrum, basi disco brevi cinctum; stylus 2·8 cm. longus, albus, glaber. *Fructus* generis, puberulus, circa 2 cm. longus; semina globosa, basi concava, echinato-tuberculata, puberula.

Surin, Sangka, 200 m., open spaces in evergreen forest, *Kerr* 8280.

Plants raised from seed collected in the above locality and forwarded by Dr. Kerr flowered at Aberdeen in 1924 and 1925. The description has been drawn up mainly from the living material.

Globba (**Marantella**) **Winitii** *C. H. Wright* (Scitamineae-Zingiberaceae); *G. atrosanguineae* Teysm. et Binn. affinis, petiolis elongatis ovarioque levi differt.

Caulis 6 dm. altus. *Folia* oblongo-lanceolata, basi cordata lobis superimpositis, acuminata, glauca praesertim facie inferiore, subtus minute puberula et ad costam sparse villosa, 18 cm. longa, 5·5 cm. lata; petiolus ad 7·5 cm. longus; vagina ad 16 cm. longa, glauca. *Panicula* axillaris, nutans, parce ramosa; bracteae ovatae, acutae, demum reflexae, 3 cm. longae, 1·8 cm. latae, infimis aggregatis sterilibusque; pedicelli inferiores 2·5 cm. longi, tenues, virides, glabri, nitentes. *Calycis* lobi oblongi, obtusi, 3 mm. longi, virides. *Corolla* lutea; tubus tenuis, infra rectangulatim sursum curvatus, pubescens, 9 mm. longus; lobi deflexi, cymbiformes, 4 mm. longi, 2 mm. lati. *Labellum* breviter bilobatum, obtusum, 7 mm. longum; staminodia lateralia oblonga, obtusa, deflexa, 8 mm. longa, 2·5 mm. lata. *Filamentum* 2 cm. longum; anthera 2 mm. longa, utrinque acute bicalcarata. *Ovarium* leve, viride.

Lampun, Mê Kaw, 420 m., moist shady banks of streams; seems to be very local; *Winit* 1228.

Roots collected in the above locality by Phra Winit Wanadorn were received at Kew and Aberdeen from Dr. A. F. G. Kerr. The plants flowered in July, 1925, and the description has been drawn up from the Kew plant. This plant produced three axillary inflorescences, two of which were in flower at the same time. At first the peduncles appear to be one-flowered, but at length branch and bear other flowers. The conspicuous bracts are magenta of the shade depicted in Klincksieck et Valette's Code des Couleurs

No. 556 and the corolla waxy yellow No. 161 of the same code. At first the bracts are erect, but quickly become reflexed and appressed to the rhachis.

XXIII.—NOTES ON KISSENIA AND THE GEOGRAPHICAL DISTRIBUTION OF THE LOASACEAE.

—J. E. Dandy.

Kissenia, the only genus of the *Loasaceae* in the Old World, is confined to desert regions in Southern Arabia, Somaliland and South-West Africa. Its range is divided into two isolated and relatively small areas (fig. 1). The first, in lat. 10°–15°N, includes Aden and extends into Hadramaut and across the Gulf of Aden into Somaliland. The other is in South-West Africa, in latitude approximately 20°–30°S.

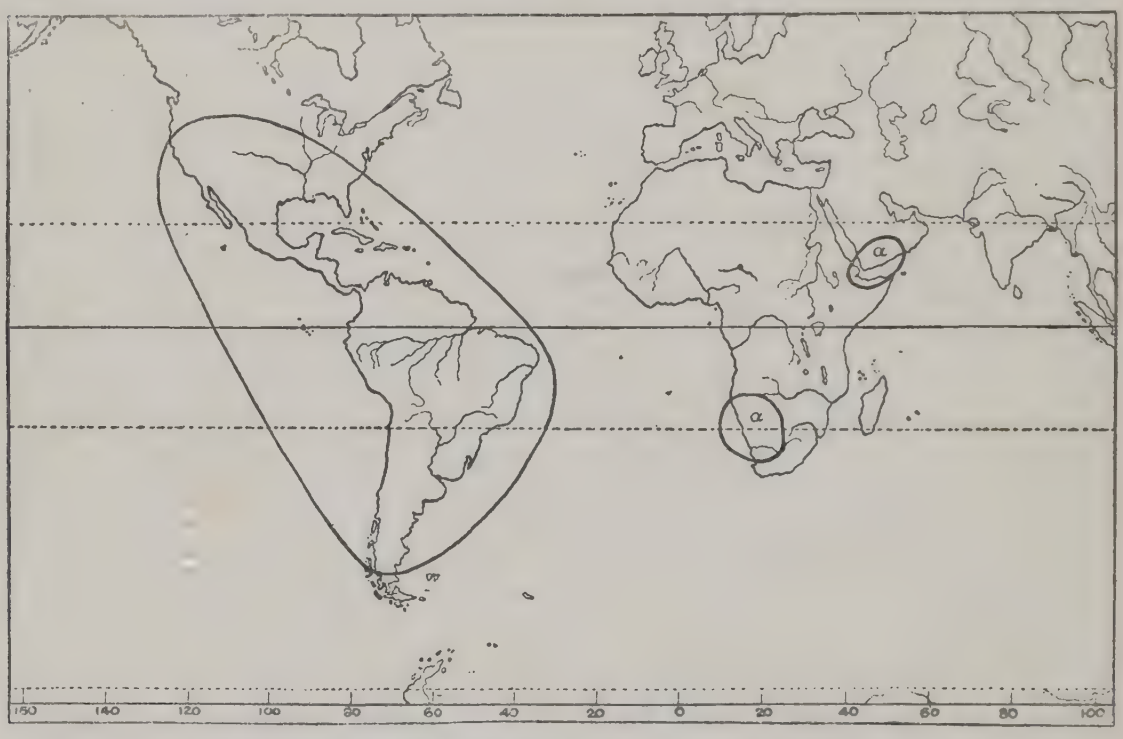

Fig. 1.—Geographical distribution of the *Loasaceae* (*a*, *Kissenia*).

The name *Kissenia* was first mentioned by Robert Brown in manuscript at the British Museum. He based his genus upon an Arabian specimen, and named it in honour of the collector, Kissen, a traveller in Arabia. The first generic description to be published was by Endlicher in 1842 (Gen. Plant., Suppl. ii, p. 76), who, by an error in spelling, gave the name as *Fissenia* and recognised one species, *F. capensis*. This name he regarded as synonymous with the *Cnidone mentzelioides* of E. Meyer, given in manuscript to Drege's specimens from the Cape.

Hitherto, the Arabian and African plants have been regarded as belonging to the same species, but the peculiar geographical distribution of the genus has given rise to attempts to distinguish two species. The two regions occupied by *Kissenia* are not only

in different hemispheres, but are, as Brongniart (Bull. Soc. Bot. Fr. vii, p. 899) points out, in different latitudes in the two hemispheres. Collection of material at Aden by Courbon in 1860 led Brongniart to send a specimen to J. D. Hooker for comparison with Cape specimens. Hooker apparently could find no specific difference, and T. Anderson (Journ. Proc. Linn. Soc. v, Suppl., p. 42), who also compared the plants, failed to separate them. Forty years later, however, Urban (Monogr. Loas. in Nov. Act. Nat. Cur. lxxvi, pp. 119 and 120) found that "specimina Asiatica et Africana satis differunt," and observed that if better material were available, two well-defined varieties might be distinguished. Poor material, and the tendency of the period to take a broad view of species, probably accounted for the failure of the earlier attempts to separate the plants.

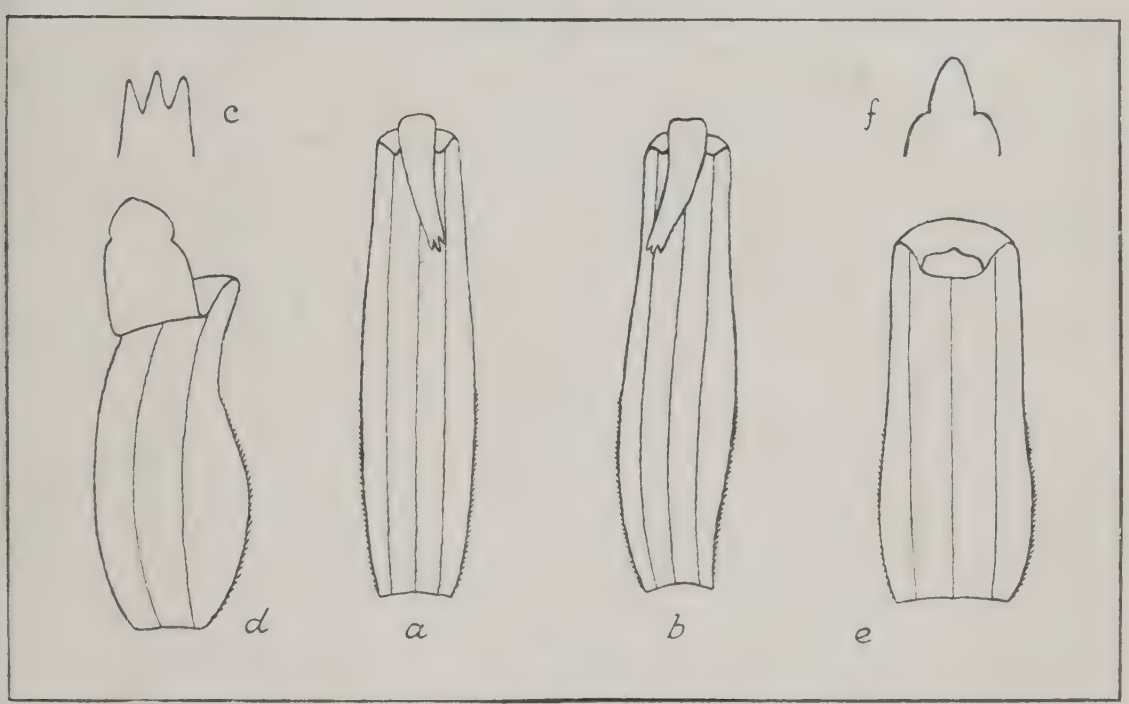

FIG. 2.—*Kissenia.*—*a*, *b*, scales, *c*, tip of scale, of specimens from Arabia; *d*, *e*, scales, *f*, tip of scale, of specimens from S.W. Africa.

A critical examination of numerous specimens in the Kew Herbarium has now fulfilled Urban's speculation. Marked differences are found in the nectariferous scales and in the leaves, which, taken in conjunction with the geographical distribution, justify the segregation of the plants into two species, the one confined to Southern Arabia and Somaliland, the other to South-West Africa.

The scales are 5 in number and alternate with the petals, of which they were formerly regarded as constituting a second whorl. Each scale is the morphological equivalent of 3 staminodes, united and modified to form a concave organ terminating in a ligule, which is reflexed and usually again folded once (fig. 2, *d*, *e*) or twice (*a*, *b*). Viewed from the back (or convex side) and disregarding the ligule, the scale in the Arabian specimens is narrowly rectangular,

while the ligule is narrowly lanceolate, and distinctly tripartite at the tip (fig. 2, *a*, *b*, *c*). In the South African plant the scale is broader in proportion, rectangular or ovate-truncate, the ligule being broader, more or less rectangular, obtuse, and entire or obscurely 3-lobed at the tip (fig. 2, *d*, *e*, *f*).

Accompanying these differences in the scales there is a difference in the shape of the leaves. These in the Asiatic form are orbicular or broadly ovate, usually not distinctly 3-lobed, and cordate at the base (fig. 3, *d–f*). In the South African specimens they are narrower, varying from ovate to ovate-lanceolate at the apex of the stem, usually markedly 3-lobed, and acute or obtuse, never cordate, at the base (fig. 3, *a–c*).

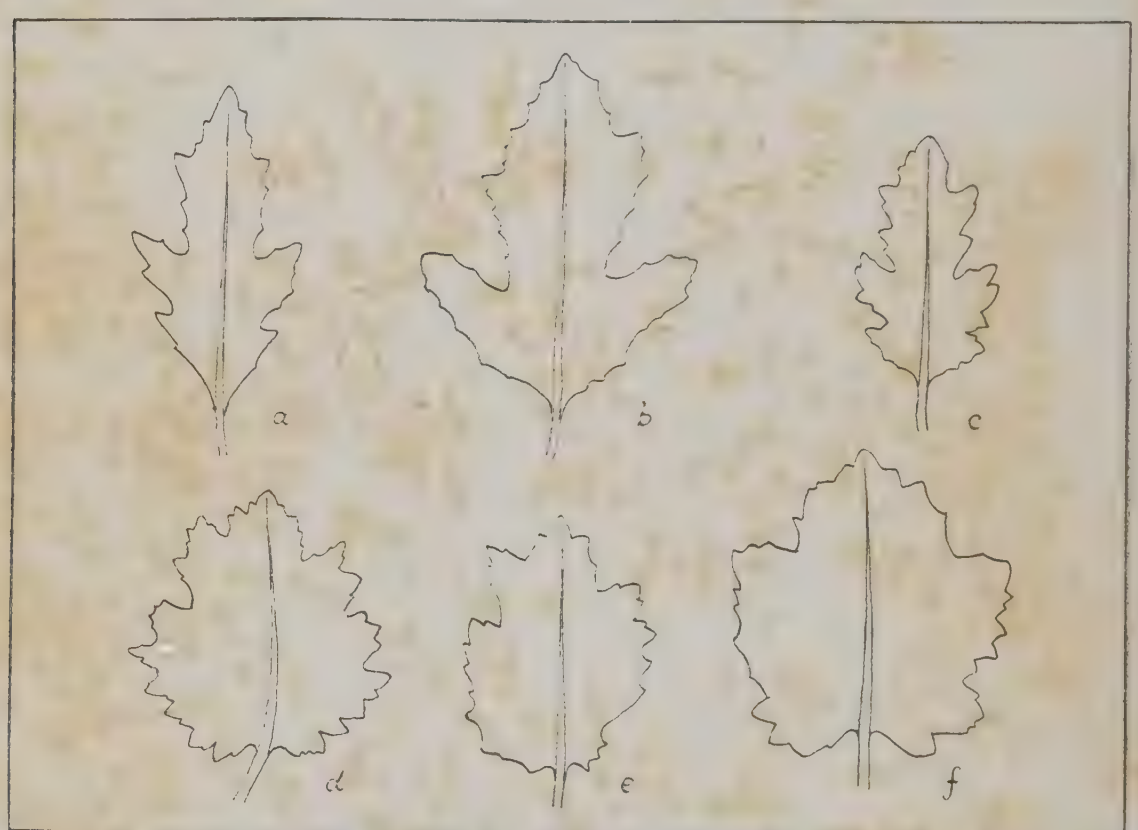

FIG. 3.—*Kissenia*.—Leaves, *a*, *b*, *c*, of specimens from S.W. Africa; *d*, *e*, *f*, of specimens from Arabia.

I am much indebted to Professor Lecomte for allowing me to examine Revoil's specimen from Somaliland, which agrees perfectly in both leaves and scales with the Arabian plants.

It is suggested that the name *Kissenia spathulata*, given by R. Brown to Kissen's specimen, be limited to the Arabian species, and *K. capensis* to that from South-West Africa. The species are now as follows :

1. **Kissenia spathulata** *R. Br. ex T. Anders.* in Journ. Proc. Linn. Soc. v, Suppl., p. 43.

Folia orbicularia usque late ovata, basi cordata, 3–7-lobulata vel rarius lobata, irregulariter dentata. *Squamae* ligula exclusa a dorso anguste rectangulares, 3–4-plo longiores quam latiores, ligula reflexa anguste lanceolata acuta apice tripartita.

SOUTHERN ARABIA. Aden: Wadi Maalla, *Schweinfurth* 27! Cirque of Shamsan, *Deflers* 2! Northern slopes, *Perry!* Shugra, *Schweinfurth* 129! Without locality, *Hunter! Thomson! Courbon! Balfour!* Hadramaut: Kishin Bay, *Kissen* (type)! Alrail, 600m., *Lunt* 127! Goldnore Valley, *Lunt* 313; Wadi Bayren, *Hirsch* 37.

SOMALILAND. Gueldora Valley, *Revoil* 50!

2. **K. capensis** *R. Br. ex Harvey* in Thes. Cap. i, p. 61 (errore *Fissenia*).

Folia ovata usque ovato-lanceolata, basi acuta vel obtusa, plerumque 3-lobata, irregulariter dentata. *Squamae* ligula exclusa a dorso rectangulares vel ovato-truncatae, 1½–3-plo longiores quam latiores, ligula reflexa plus minusve rectangulari obtusa apice integra vel obsolete 3-lobata.—*Cnidone mentzelioides* E. Meyer in Drege, Zwei Pflanz. Docum., p. 93, nomen; *K.* (*Fissenia*) *mentzelioides* R. Br. ex Harvey in Thes. Cap. i, t. 98.

SOUTH-WEST AFRICA. Hereroland, *Pechuel-Lösche*; Welwitsch, *Galpin and Pearson* 7631! Lat. 23°S, *Chapman and Baines!* Damaraland, without locality, *Een!* Keetmanshoop, *Dinter* 3556! *Durham* 14! Sandy valley leading down to Bethany Drift, *Pearson* 6951! Sandy flats near An'Aap R., *Atherstone* 10! Between Verleptpram and mouth of Gariep, *Drege* (type)! Rocks in kopje near Gabis, *Pearson* 4323! Hills at Wolveton, 520m., *Schlechter* 11439! Broken ground west of Pella, *Pearson* 3544! Without locality, *Drege!*

The peculiar geographical range of *Kissenia* aroused interest in the distribution of the remainder of the *Loasaceae*. In his monograph of the family, Urban (Monogr. Loas. in Nov. Act. Nat. Cur. lxxvi) recognised 13 genera, and 2 more have since been described. The 250 species are arranged in three subfamilies : *Gronovioideae*, *Mentzelioideae*, and *Loasoideae*. The *Gronovioideae*, with 4 genera and only 9 species, occupy an isolated position, being characterised by 5 stamens and one ovule pendulous from the apex of the ovary. The other two subfamilies have both numerous stamens and ovules, and parietal placentation.

Mentzelioideae (fig. 4). In the *Mentzelioideae* the numerous stamens are not collected into bundles, and nectariferous scales are lacking. This subfamily thus appears to be the most primitive group of the *Loasaceae*, and is therefore considered first.

Mentzelia, with about 64 species, is easily the largest genus, and probably represents the ancestral type of the family. It is spread over America from the North-Western United States to Patagonia, this being the range of the whole family, excepting *Kissenia*. One species, *M. aspera*, occurs over this whole range, including the Galapagos Is., West Indies, and Brazil, while another, *M. albescens*, is found in Texas and Northern Mexico, and in Chile and the Argentine. All the others are confined either to Mexico and the Western United States or to Western and Temperate South America. *Schismocarpus* (Blake in Contr. Gray Herb., N.S. 53,

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p. 61) is a monotypic genus from Oaxaca in Mexico, and, according to Gilg, is doubtfully distinct from *Mentzelia*.

Eucnide (10 spp.) occurs in Mexico and the South-Western United States; it shews advancement over *Mentzelia* in the protrusion of the placentae and the realisation of the tendency shown in that genus towards coherence of the petals at the base. *Sympetaleia* is still more highly evolved in this direction, having a tubular corolla. Its 3 species are confined to Lower California and the State of Sonora just across the Gulf of California.

The distribution, shown in fig. 4, supports the conclusion that *Mentzelia* is the most primitive type of the *Mentzelioideae*, and indicates Mexico and the South-Western United States as the centre of development of this subfamily. *Eucnide* and *Sympetaleia*

FIG. 4.—*Mentzelioideae.*—1, *Mentzelia*; 2, *Schismocarpus*; 3, *Eucnide*; 4, *Sympetaleia.*

FIG. 5.—*Gronovioideae.*—1, *Gronovia*; 2, *Fuertesia*; 3, *Cevallia*; 4, *Petalonyx.*

appear to be comparatively recent products of evolution in this centre.

Loasoideae (figs. 1, 6, and 7). The members of this subfamily have the stamens grouped into bundles, the fertile opposite the petals and the sterile opposite the sepals. In the typical *Loasoideae* (*i.e. Loaseae* and *Kissenieae*) the staminodes are united to form nectariferous scales opposite the sepals.

Urban's first tribe, *Klaprothieae*, affords a link between this subfamily and the first in not having the staminodes united to form scales. Its two genera, *Klaprothia* and *Sclerothrix*, are both monotypic, and have tetramerous flowers. *Sclerothrix*, however, is the more advanced in possessing a twisted capsule, and is also the more widespread (fig. 6), extending from Mexico to Brazil, Peru, and the

Galapagos Islands. *Klaprothia* is confined to North-Western South America. The wider range of the more recent type is probably due to superior dehiscence mechanism afforded by the twisted capsule.

The remaining genera constitute the *Loasoideae* proper, of which *Loasa*, with a straight capsule, is the basal type. This, with 95 species, is the largest genus of the family, but is not so widely distributed as *Mentzelia*. The species are mainly concentrated between Peru and Patagonia, but by means of a few outliers the genus extends into Southern Mexico, while one species is restricted to Santo Domingo in the West Indies (fig. 7). *Scyphanthus* (2 spp.) is confined to a small region in the Andes of Chile. It

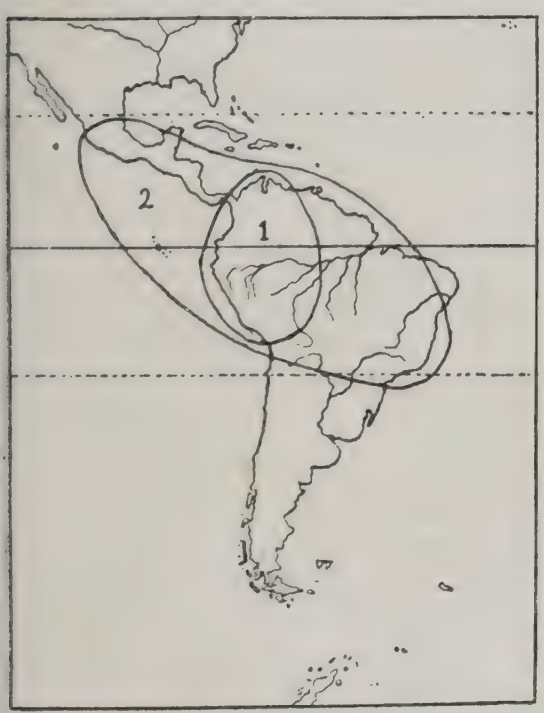

FIG. 6.—*Loasoideae* (*Klaprothieae*).—1, *Klaprothia*; 2, *Sclerothrix*.

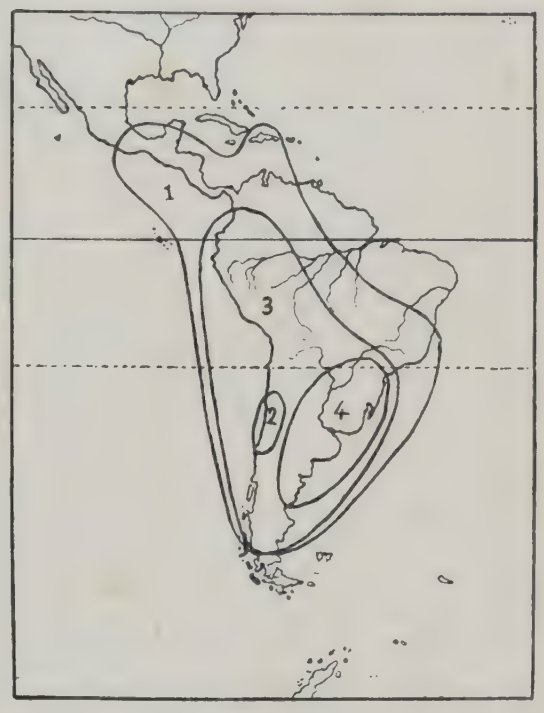

FIG. 7.—*Loasoideae* (*Loaseae*).—1, *Loasa*; 2, *Scyphanthus*; 3, *Cajophora*; 4, *Blumenbachia*.

shews advancement over *Loasa* in the elongation and more complete dehiscence of the capsule.

The twisted capsule, as mentioned above, occurs in the *Klaprothieae*. This feature again appears in *Cajophora* and *Blumenbachia*. *Cajophora* is a large genus of about 60 species, in which the tendency towards twisting of the ovary is not absolutely fixed, a few species having straight fruits. The twisting of the capsule in *Sclerothrix* and *Cajophora* appears to afford an example of parallel evolution. The two cases differ, for in *Sclerothrix* the capsule dehisces from the apex; in *Cajophora* the carpels remain attached at the tip. The distribution of *Cajophora* resembles that of *Loasa* in the south, but the former does not reach Central America. *Blumenbachia*, with 4 species, has a more elaborate capsule than *Cajophora*, and only extends from South-Eastern Brazil and Paraguay to Patagonia.

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The distribution of the *Loaseae* (fig. 7) points to Chile and the Argentine as their centre of development, with *Loasa* as the most ancient type. *Cajophora* and *Blumenbachia*, with their more efficient dehiscence mechanism, may be more recent in origin than their range suggests.

Kissenia differs from the remainder of the *Loasoideae* in the bilocular ovary with 3 subapical ovules and in the sepals forming wings on the fruit. Its distribution (fig. 1) has already been considered. On the Wegener Theory of Continental Drift, the occurrence of *Kissenia* in South-West Africa would accord with the above conclusion as to the centre of development of the tribe *Loaseae*, but the presence of *K. spathulata* in Somaliland and Arabia offers a difficult problem. Probably *Kissenia* formerly extended across Africa from South-West Africa to what is now Southern Arabia, and the complete isolation of its present localities, perhaps through changes in elevation, has resulted in the slight differences noted above.

Gronovioideae (fig. 5). This, as stated above, is a small subfamily standing apart from the rest of the *Loasaceae* in possessing only 5 stamens, one pendulous ovule, and a one-seeded, indehiscent fruit. Its range extends from the South-Western United States to Ecuador, with one species in the West Indies.

The genera are somewhat scattered in their distribution. *Gronovia* (2 spp.) is the most widely spread, reaching from Central Mexico to Ecuador and Venezuela. *Fuertesia* (Urban in Ber. Deutsch. Bot. Ges. xxviii, p. 520) is monotypic and confined to the island of Santo Domingo ; it has divided petals and is exceptional amongst the *Loasaceae* in being woody. Since the plant is a climber, this latter character is probably secondary and not primitive. *Cevallia* differs from *Gronovia* in the capitate inflorescence and the connectives produced as tongue-like appendages, a combination of characters found in many *Compositae*. It possesses 2 species, inhabiting New Mexico, Texas, and Mexico. In *Petalonyx* there is a tendency towards sterilisation of the androecium. Four species are known, of which two have all 5 anthers fertile and 4-locellate; a third has all 5 fertile, but the posticous one is sometimes 2- or 3- instead of 4- locellate; in the fourth species only the two anticous stamens are fertile. The genus is restricted to the South-Western United States and North-Western Mexico.

The distribution of the *Gronovioideae* (fig. 5) suggests that they had their origin in Central America, perhaps in the same region as the *Mentzelioideae*. There are no links connecting them with the rest of the family, and if they arose from the *Mentzelia*-type, they must have diverged from it at an early date. The most widespread genus, *Gronovia*, appears also to be the most primitive, but its range overlaps neither that of *Fuertesia* nor *Petalonyx*.

XXIV.—HUMBOLDT AND BONPLAND'S ITINERARY IN ECUADOR AND PERU. N. Y. Sandwith.

At the end of December, 1801, or the beginning of January, 1802, Humboldt and Bonpland entered Ecuador from Colombia by the Puente de Rumichaca, and passing the great crevasse of Chota and the town of Ibarra, arrived at Quito on January 6th, 1802. Here they remained until July, and undertook expeditions to the neighbouring mountains of Antisana and Pichincha (ascended three times), as well as to others less well known. Towards the end of their stay the formidable ascent of the more distant Chimborazo was also accomplished, the party starting from Quito on June 23rd.

Some time during July the travellers left Quito and continued their journey south to Cuenca and Loxa, beginning with an attempt on Cotopaxi, which they had apparently postponed until after their departure from Quito, though it was not nearly so far distant as Chimborazo. Some days were spent at Cuenca, and again at Loxa, which was an important centre for the Cinchona forests. It is difficult to understand at what stage of their itinerary certain places in the coast region near the frontier of Peru and Ecuador were visited by Humboldt and Bonpland, unless this took place from Loxa; the dates of flowering (July and August) of species collected in these localities support this assumption; but Lambayeque at least lies perhaps too far south, and may have been visited from Huambos, Caxamarca or even from Truxillo. The absence of any detailed chronological account of Humboldt and Bonpland's travels in these countries has necessarily caused one or two difficulties of this kind. From Loxa the route lay south to the Rio Macara, which is the modern frontier of Ecuador and Peru, and on entering Peru the travellers proceeded through the district round the mountain of Ayavaca to Huancabamba, and from there in a south-easterly direction, through the province of Bracamoros, to the banks of the Upper Amazons, or more correctly of the Rio Marañon, which were clothed with *Andira* and *Bougainvillea*. After a month in this province, they returned to the Andes, and after passing the mines of Hualgayoc, and the city of Caxamarca with its famous Inca palace, descended to the coast at Truxillo. From Truxillo the route followed the coast down to Lima, where Humboldt and Bonpland stayed from October 23rd to December 5th, the day on which they took ship for Guayaquil. They reached the port on January 9th, 1803, and remained in this part of Ecuador until February 15th, when they left by sea for Mexico, landing at Acapulco on March 23rd.

For the convenience of botanists, the following itinerary is divided into two sections, the first containing all the localities which are in Ecuador, the second those in Peru. This division does not interrupt the main chronological sequence of the itinerary very seriously; it involves the insertion of the Guayaquil localities

under their special heading at the end of the section devoted to Ecuador; and a few places on the northern Peruvian littoral, which were apparently visited from Loxa in Ecuador, are placed in the Peruvian section under the most appropriate heading, with a note indicating that their position is geographical rather than chronological. Apart from this the headings and the places visited are placed as far as possible in the most likely chronological and geographical order, but mistakes may easily occur, as several places—notably round Ayavaca in Peru—have eluded discovery on even the best maps. Again, the evidence left by Humboldt is sometimes so vague that the sequence becomes decidedly theoretical, as for instance that of the localities visited between Huancabamba, the Rio Marañon and Huambos. The interruption of the continuous itinerary for several months at Quito introduced a special difficulty, which resulted in the decision to indicate the headings of the continuous itinerary in Ecuador by separate capital letters A, C, D, E, and the Quito headings by B. The localities visited from Quito, except those near Chimborazo, seemed to fall naturally under four headings, and these are titled B. 1, B. 2, B. 3, B. 4. The case of the Chimborazo localities was different. They were visited on a special expedition from Quito, but they lie so far to the south and so near the line of the later continuous route, that it seemed preferable to place them in heading C in their natural geographical position, once more indicating this chronological irregularity by a note. Many of the localities between Quito and Riobamba were obviously passed both on the expedition to Chimborazo and on the later journey south to Cuenca, and it would have been undesirable, as well as exceedingly difficult, to list them twice under two headings. The capital letters A, B, C, D are used again in the treatment of the Peruvian section.

Places which can be found on most maps are printed in black type except when, for example between Truxillo and Lima in Peru, many successive places equally merit this distinction, in which case the reason for so printing them at once disappears.

The altitudes are those given in Humboldt's classified lists of localities in the Nova Genera et Species Plantarum, vol. vii, pp. 379–382, 417, 418.

Principal Sources of Information.

1. Bruhns, K., Alexander von Humboldt, eine wissenschaftliche Biographie (Leipzig, 1872). Vol. i, Chapters v–vii. pp. 360–384 (travels in Ecuador and Peru). Beilagen, pp. 464–466 (chronology of travels in tropical America).

2. Humboldt, A. Atlas Géographique et Physique du Nouveau Continent (1814–1834).

3. Humboldt, A. Atlas Pittoresque: Vues des Cordillères, etc. (Paris, 1810).

4. Humboldt, Bonpland et Kunth, Nova Genera et Species Plantarum (Paris, 1825). Vol. vii, pp. 379–382, 417, 418 (classified

lists of localities in Ecuador and Peru); pp. 382–413, 418–429 (enumeration of plants collected in Ecuador and Peru, with their localities).

5. André, Éduard, "L'Amérique Équinoxiale" in Charton, Le Tour du Monde (Paris); 1883, xlv, 356–416 (numerous illustrations and several maps).

6. Whymper, E., Travels amongst the Great Andes of the Equator (London, 1892).

7. Spruce, R., Notes of a botanist on the Amazon and Andes, ed. Wallace, vol. ii, pp. 163–342 (London, 1908).

The following large maps, in addition to those mentioned under the separate headings of the itinerary, have been found useful :—

Villavicencio, Carta Corografica de la Republica del Ecuador (1858).
Wolf, T., Carta Geografica del Ecuador (1892).
Raimondi, Mapa del Peru, foja 1–7.
Mapa del Peru por la Sociedad Geografica de Lima (1912).

Itinerary.

I. In Ecuador.

A. From Colombian frontier to Quito, end of December, 1801 or beginning of January, 1802—January 6th, 1802.

(*vide* H. B. K., Nov. Gen., vii. 379–380; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, tt.5,22; Atlas Pittor., pp. 241–2, pl. 42 (Cayambé); André in Le Tour du Monde 1879, xxxviii, 354, map; 1883, xlv, 339, map; Whymper, Travels amongst the Great Andes of the Equator, 1892, maps at end).

1 Puente de Rumichaca; 2 **Tulcan**; 3 Paramo del Boliche, 10,788 ft.; 4 Rio de Huaca; 5 Paramo de Puntas; 6 Hacienda de Chumban, 8,688 ft.; 7 Tusa; 8 El Dorado; 9 Cuesaca, 8,478 ft.; 10 Alto de Pucara (E. of Mira), 9,756 ft.; 11 San Vicente ; 12 Valle de Chota, 4,962 ft.; 13 Villa de **Ibarra**, 7,104 ft.; 14 Nevado de **Cotocachi**, 15,420 ft.; 15 Cerro de **Imbabura**, 14,040 ft.; 16 **Otavalo**; 17 Nevado de **Cayambé**, 18,180 ft.; 18 San Antonio de Lulumbamba, 7,650 ft.; 19 Puente de Rio Guaillabamba, 6,180 ft.; 20 Caraburu; 21 El Quinche; 22 Yaruqui; 23 Puembo; 24 Guapulo; 25 **Quito**, 8,952 ft.

B. 1. Quito, and localities in immediate neighbourhood lying chiefly south and east, January—July, 1802.

(*vide* H. B. K., Nov. Gen., vii, 380; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t. 27 (abbrev. H.); André in Le Tour du Monde, 1883, xlv, 388, 390, 403, maps (abbrev. A.); Whymper, Travels amongst the Great Andes of the Equator, 1892, maps at end (abbrev. W.); Spruce, Notes of a botanist on the Amazon and Andes, ed. Wallace, 1908, vol. ii, map facing p. 220 (abbrev. Spr.)).

26 **Quito**; 27 Rio Machangara (H.A.); 28 Panecillo (Javirac), 9,606 ft. (H.A. Spr.); 29 La Chilena (A.) ; 30 Cerritos de Izimbia (H.) *or* Ichimbia (A.) y Poingasi (Puengasi, W.); 31 Inaquito; 32 Magdalena (H.A.W.); 33 Llano de Turubamba (H.A.W.); 34 Rumipamba; 35 Chillo, 8,040 ft.; 36 Llano de Cachapamba; 37 Rio San Pedro (A.); 38 Burro Potrero; 39 Rio Pita (A.W.); 40 Guangopolo (A.); 41 Conocoto (A.W.); 42 Sangolqui (A.W.); 43 Ichubamba (W.); 44 Alangasi (A.W.); 45 Cerros de Langasi y Ilalo; 46 Pifo (A.W.); 47 Tumbaco (A.W.).

B. 2. Ascent of Antisana from Quito, March 16th, 1802.

(*vide* H. B. K., Nov. Gen., vii. 380; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t.26, map of Antisana).

48 **Quito**; 49 Pintac, 9,516 ft.; 50 Pinatura; 51 Volcan de Ansango; 52 Lecheyacu; 53 Llanos de Santa Lucia y Cuvillan, 12,480 ft.; 54 Laguna Mica; 55 Hacienda de Antisana, 12,624 ft.; 56 Chussulongo; 57 **Antisana**, 17,958 ft.

B. 3 Ascents of Pichincha from Quito, April 14th, May 26th and 28th, 1802.

(*vide* H. B. K., Nov. Gen., vii. 380; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t. 27, map of Pichincha; Atlas Pittor., pp. 291–2, pl. 61).

58 **Quito**; 59 Chorera de Cantuna; 60 La Cruz de Pichincha; 61 Valle de Cundurguachana; 62 Cerro de Lumbili; 63 Lloa Chiquito; 64 Valle de Yuyucha; 65 Verdecuchu, 13,038 ft.; 66 La Ciénaga del Volcan; 67 Llanos de Altarcuchu, 13,530 ft.; 68 Palmascuchu, 13,680 ft.; 69 Tablahuma, 14,136 ft.; 70 Cono de los Ladrillos, 14,412 ft.; 71 Guagua-Pichincha; 72 Rucu-**Pichincha**, 14,412 ft.

B.4. Other mountain districts near and south of Quito, visited between January and July, 1802.

(*vide* H. B. K., Nov. Gen., vii, 380; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t.5 (abbrev. H.); Atlas Pittor., pp. 233–4, pl. 35 (Iliniza), pp. 273–4, pl. 51 (Corazon); André in Le Tour du Monde, 1883, xlv, 388, 403, maps (abbrev. A.); Whymper, Travels amongst the Great Andes of the Equator, 1892, maps at end (abbrev. W.); Spruce, Notes of a botanist on the Amazon and Andes, ed. Wallace, 1908, vol. ii, map facing p. 220 (abbrev. Spr.)).

73 **Quito**; 74 Atacazo (H. A. W.); 75 Tambillo, 9,000 ft. (A. W.); 76 Passuchua (Pasochoa, W.); 77 Corazon, 14,856 ft. (H. A. W. Spr.) ; 78 Altos de Chisinche (H.) y Tiopullo (W.); 79 Machache (A. W. Spr.); 80 Ruminaui (A. W. Spr.); 81 **Iliniza**, 16,302 ft.

C. Quito to Alausi and the mountains of Assuay, via Cotopaxi, Ambato and Riobamba, July, 1802. [N.B.—The ascent of Chimborazo is inserted here in its geographical position, though it was undertaken independently from Quito in June, 1802.]

(*vide* H. B. K., Nov. Gen., vii. 380, 381; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, tt. 5 and 9, map of Chimborazo (abbrev. H.); Atlas Pittor., pp. 102–107, 200–202, pl. 16 and 25 (Chimborazo), pp. 41–47, pl. 10 (Cotopaxi), and pp. 230–2, pl. 33 (bridge of ropes at Penipe); André in Le Tour du Monde, 1883, xlv, 403 map (abbrev. A.); Whymper, Travels amongst the Great Andes of the Equator, 1892, maps at end (abbrev. W.); Spruce, Notes of a botanist on the Amazon and Andes, ed. Wallace, 1908, vol. ii, maps facing pp. 220, 310, 524, (abbrev. Spr.)).

82 **Quito**; 83 Casa del Inca de Callo (A. W. Spr.); 84 Rio Saquimala (Spr.); 85 **Mulalo** (Mulahalo); 86 Rio de los Baños, 9,540 ft.; 87 Casa del Paramo de Pansache, 11,322 ft.; 88 Cerro de Pumaurcu; 89 Alto de Suniguaicu, 13,578 ft.; 90 Cerro de Quelendaña (A. W. Spr.); 91 **Cotopaxi**, 17,712 ft.; 92 La Cabeza del Inca-Tacunga (**Latacunga**, Llactacunga), 8,892 ft.; 93 Asiento de Hambato (**Ambato**); 94 Altos de Guacha (Gauchi, A. Spr.) y Millaflores, 8,310 ft.; 95 Pelileo, 7902 ft. (A. W.); 96 Altos de Igualate (A. W.); 97 Rio Patate (A. W. Spr.); 98 Hacienda de Gansce; 99 Cuchilla de Gandisava, 9,948 ft.; 100 **Tunguragua**, 15, 264 ft. (A. W. Spr.); 101 Puente de Rio Puela, 7,440 ft. (A. W. Spr.); 102 Penipe (A. W. Spr.); 103 Capa Urcu (Cerro del Altar, A. W. Spr.); 104 Tapia; 105 Los Collanes (W. Spr.); 106 Valle de Achambo (Chambo, A. W. Spr.); 107 **Riobamba** nuevo, 8,898 ft.—108 Cerro de Yanaurcu (H.); 109 Calpi, 9,726 ft. (H. A. W.); 110 Cerro de Naguangachi; 111 Llanos de Luisa y Sisgun (H.); 112 Laguna Yanacoche, 12,600 ft. (H.); 113 **Chimborazo**, 21,300 ft. —114 Cerro del Condorasto (Spr.); 115 Guamote, 9,588 ft. (A. W. Spr.); 116 Llanos de Tiocaxas (A. W. Spr.); 117 Ticsan (A. W. Spr.); 118, **Alausi**, 7,488 ft.; 119 Cerro Quello; 120 Pomallacta (W. Spr.); 121 Paramo de **Assuay**, 8,988 ft.

D. Mountains of Assuay to Cuenca, Loxa and neighbourhood, and Peruvian frontier, July—August, 1802.

(*vide* H. B. K., Nov. Gen., vii. 381; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, tt. 5, 22 (abbrev. H.); Spruce, Notes of a botanist on the Amazon and Andes, ed. Wallace, 1908, vol. ii., map facing p. 310 (abbrev. Spr.); maps of Sievers' travels in Ecuador and Peru in Petermanns Geogr. Mittheil., 1915, tt. 24, 25, 26 (abbrev. Siev.)).

122 Paramo de **Assuay**, 8,988 ft.; 123 Cerro de Sitzan, 11,622 ft.; 124 Alto de Pilches; 125 Ladera de Cadlud, 14,508 ft.; 126 Los Paredones del Inca Tupayupangi, 12,444 ft. (Siev.); 127 Pullal; 128 Cañar (Spr., Siev.); 129 Ingachungana; 130 Villa Turche; 131 Paramo de Voeste; 132 Burgay, 9,300 ft.; 133 Delay

(Siev.); 134 **Cuenca**, 8,106 ft.; 135 Los Baños; 136 Tarqui (Siev.) 137 Cumbe, 8,502 ft. (Siev.); 138 Paramo de Sarar, 11,400 ft.; 139 **Nabon**, 8,538 ft.; 140 Ingapilca de Cochapata, 8,160 ft. (Siev.); 141 Valle del Rio Uduchapa, 6,816 ft. (Siev.); 142 **Oña**, 7,560 ft.; 143 Paramo de Alpachaca, 10,200 ft.; 144 Valle del Rio Saraguru, 6,918 ft. (H.); 145 Cerro de Pulla, 9,384 ft.; 146 Valle de Vinayacu; 147 **Loxa**, 6,348 ft.; 148 Cerros de Caxanuma, Uritusinga, Rumisitana, Boqueron, Villonaco y del Montje; 149 Catacocha (Siev.); 150 **Zaruma**; 151 **Santa Rosa**; 152 Malacates (Siev.); 153 Valle del Rio Catamayo (H. Siev.); 154 **Gonzanama**, 6,438 ft.; 155 Lucarque; 156 Llano de Trigobamba; 157 Salto del Fraile; 158 Coleisaca; 159 Valle del Rio Calvas (**Rio Macara**) (Siev.).

E. Guayaquil and neighbourhood, mainly to the north-east towards Chimborazo, Jan. 9th—Feb. 15th, 1803.

(*vide* H. B. K., Nov. Gen., vii. 382; Humb. et Bonpl., Voyage, Atlas Géogr., sér, 1, t. 22; Atlas Pittor., pp. 295–6, pl. 63; André in Le Tour du Monde, 1883, xlv, 403, map; Whymper, Travels amongst the Great Andes of the Equator, 1892, maps at end; Spruce, Notes of a botanist on the Amazon and Andes, ed. Wallace, 1908, vol. ii, map facing p. 310).

160 **Guayaquil**; 161 Rio de Guayaquil; 162 **Rio Daule**; 163 San Borondon; 164 Estero del Lagarto; 165 Bodegas de **Babahoya**, 72 ft.; 166 Rio Caracol; 167 Invernadero del Garzal; 168 Ujibar.

II. In Peru.

A. From the frontier of Ecuador through the Ayavaca region to Huancabamba, August, 1802.

(*vide* H. B. K., Nov. Gen. vii., 417; Humb. et Bonpl., Atlas Géogr., sér. 1, tt. 5, 22; map of Sievers' travels in Ecuador and Peru in Petermanns Geogr. Mittheil, 1915, t. 25; vegetation map of Peruvian Andes in Petermanns Geogr. Mittheil., 1922, t. 13; but only a few of the following localities are marked on these maps).

169 **Rio Macara**; 170 Rio Cutaco; 171 Succhubamba; 172 **Ayavaca**, 8,442 ft.; 173 Olleros; 174 Aipate; 175 Santa Rosa; 176 Rio Aranza; 177 Yanta, 3,834 ft.; 178 Gualtaquillo, 3,924 ft.; 179 Rio Cachiyacu; 180 **Rio Quiros**; 181 Paramo de Guamani, 10,284 ft.; 182 Paramo de Chulucanas, 8,100 ft.; 183 Pate Grande; 184 Guancabamba (**Huancabamba**), 6,162 ft.

B. From Huancabamba to the Rio Marañon, and thence by Huambos and Hualgayoc to Caxamarca, August, 1802.

(*vide* H. B. K., Nov. Gen., vii, 381, 382, 417; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, tt. 5, 22; Atlas Pittor., pp. 221–2, pl. 31; map of Sievers' travels in Peru in Petermanns Geogr. Mittheil., 1915, t. 24; vegetation map of Peruvian Andes in Petermanns Geogr. Mittheil., 1922, t. 13).

185 Guancabamba (**Huancabamba**), 6,162 ft.; 186 Sondorillo, 6,030 ft.; 187 Valle de Zaulaca, 4,086 ft.; 188 Sagique; 189 Laguna de Hacatacumba; 190 **San Felipe**, 5,892 ft.; 191 Chontali; 192 Colasey; 193 Pomahuaca; 194 Paramo de Yamoca, 8,340 ft.; 195 Ingatambo, 3,342 ft.; 196 Valle de Rio Chamaya (Rio Guancabamba); 197 Passo de Pucara, 3,012 ft.; 198 Las Huertas, 2,970 ft.; 199 Passo de Matara, 2,592 ft.; 200 Passo de Cavico, 2,100 ft.; 201 Sonanga; 202 Chamaya, 1,554 ft.; 203 **Choros**; 204 Tomependa, 1,158 ft.; 205 **Rio Chinchipe**; 206 Rio Amazones (**Rio Marañon**); 207 Pongo de Rentema; 208 Puyaya; 209 **Jaen** de Bracamoros; 210 Querocotillo; 211 Guambos (**Huambos**); 212 Montan, 8,040 ft.; 213 Santa Cruz; 214 Micuipampa, 11,136 ft.; 215 Gualgayoc (**Hualgayoc**), 12,000 ft.; 216 **Caxamarca**, 8,784 ft.

C. From Caxamarca to Truxillo, between August and October, 1802. [N.B.—A few localities in the Peruvian coast-region considerably to the north of Truxillo, which were apparently visited from Loxa in July and August, 1802, are inserted here after Truxillo.]

(*vide* H. B. K. Nov. Gen., vii, 417, 418; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, tt. 5, 22; Petermanns Geogr. Mittheil., 1910, t. 6; 1915, t. 24; 1922, t. 13 (vegetation map)).

217 **Caxamarca**, 8,784 ft.; 218 Cerro de Santa Polonia, 9,192 ft.; 219 Paramo de Yanaguanga; 220 Magdalena; 221 Valle de Santa Magdalena, 4,140 ft.; 222 Aramo; 223 Cundurcaga (Cerro de Cunturcagua); 224 Guangamarca, 7,506 ft.; 225 Contumasay (**Contumaza**); 226 Los Chorillos, 6,744 ft.; 227 Cascas, 4,110 ft.; 228 Chala, 1,272 ft.; 229 Los Molinos, and 230 San Diego, 576 ft.; 231 **Truxillo,** 192 ft.—232 **Lambayeque**; 233 **Piura**; 234 **Payta**; 235 **Tumbez**.

D. From Truxillo and neighbourhood along the coast down to Lima and neighbourhood, October—December 5th, 1802.

(*vide* H. B. K., Nov. Gen., vii. 418; Humb. et Bonpl., Voyage, Atlas Géogr., sér. 1, t. 5; Petermanns Geogr. Mittheil., 1910, t. 6; 1915, t. 24; 1922, t. 13 (vegetation map)).

236 **Truxillo**, 192 ft; 237 Guanchaco (Huanchaco); 238 Guamang (Huaman); 239 Manciche (Mansiche); 240 Moche; 241 Santa; 242 Rio Guanbacho; 243 Casma; 244 Guarmey (Huarmey); 245 Patibilca; 246 Huaura; 247 Chancay; 248 **Lima**; 249 Rio Rimac; 250 **Callao**; 251 Isla San Lorenzo.

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XXV.—MISCELLANEOUS NOTES.

William Bateson.—The death of Dr. William Bateson, F.R.S., on February 8th, 1926, is a calamity of world-wide significance. This is not the place to put on record Dr. Bateson's great contributions to biological science, especially in connection with problems of genetics ; it only remains for Kew to mourn the loss of Dr. Bateson as the Director of the John Innes Horticultural Institution at Merton, with which Institution the Royal Botanic Gardens, Kew, have been in close and very friendly touch since its creation. Dr. Bateson often visited Kew and whenever possible it was a privilege to assist him in his researches. He was always ready to give Kew the benefit of his extensive and critical knowledge. We remember with gratitude that when it was decided, in 1921, to give a course of lectures on Genetics to our Student Gardeners, Dr. Bateson was good enough to come over and deliver the first Course.

John Burchmore Harrison.—We learn with great regret that Sir John Harrison, C.M.G., Director of the Department of Science and Agriculture, British Guiana, died at Georgetown, British Guiana, on February 8th, 1926, on the eve of his retirement.

Sir John spent his life in the Colonial service and rendered most distinguished and valuable service not only in Agricultural and Botanical matters but also in matters relating to Chemistry and more especially to Geology.

After taking his degree at Cambridge, where he was a scholar of Christ's College, he was appointed Island Professor of Chemistry and Agricultural Science in Barbados, and his name will be always remembered in association with that of Mr. Bovell in connection with their work on seedling sugar canes resulting from the discovery of fertile sugar-cane seed.

In the year 1889 he was appointed Government Analyst and Professor of Chemistry, British Guiana, and in 1904 he became Director of the Department of Science and Agriculture on the creation of this department in the Colony.

Sir John was created a C.M.G. in 1901, and received the honour of Knighthood in 1921, and on several occasions he was specially thanked by the Secretary of State for the Colonies for his services to Tropical Agriculture. In all matters relating to the scientific development of British Guiana he took the most lively interest, and it can be said that our knowledge of the economic resources of the Colony is very largely due to him.

Sir John was keenly interested in the project, recently put forward by Kew, for the preparation of a Flora of British Guiana and furnished his Government with a very complete memorandum in support of the proposals. It is much to be regretted that he was not spared to see the proposal carried through ; but it is to be hoped that, though his counsel can be no longer sought, the Government of British Guiana will agree to the work being undertaken.

The preparation of a Flora of the Colony to which Sir John Harrison devoted to the full his great abilities, would be a very fitting tribute to his memory, especially as he had pointed out on several occasions how essential is an exact knowledge of the Flora of British Guiana for its proper economic development.

Henry Alford Nicholls.—The death of Sir H. Alford Nicholls, C.M.G., M.D., F.L.S., so shortly after the honour of Knighthood had been conferred upon him, is a sad loss to the Island of Dominica. For nearly fifty years Dr. Nicholls had resided in the island and rendered valuable medical service, and since 1904 he had acted as Principal Medical Officer of Dominica.

It is, however, on account of Dr. Nicholl's interest in agricultural and botanical matters that Kew wishes to pay a tribute of respect to his memory.

For very many years Dr. Nicholls was a constant correspondent of Kew on Botanical and Agricultural matters affecting the welfare of Dominica and the encouragement and progress of every kind of agricultural enterprise was his chief interest, or rather recreation, whenever his medical duties would allow.

His "Textbook of Tropical Agriculture," first published in 1892—dedicated to Sir Joseph Hooker in recognition of the help and encouragement he received from Kew—has been of considerable value to planters and has passed through eight editions.

Kew possesses very many letters from Dr. Nicholls, commencing with letters to Sir Joseph Hooker prior to the year 1880, and among his earliest is one announcing the despatch of a consignment of seed of *Hymenaea Coubaril* for Kew, and suggesting that some should be sent to the East as the timber is of so much value. He also referred to his efforts to introduce *Phytelephas macrocarpa* to the island and the fine specimen now in the Botanic Garden, Dominica, is probably the result of his activities.

In all his letters he referred to plants of botanical or economic interest and Kew is greatly indebted to him for a large number of living specimens of interesting native Dominican plants, which he sent over in Wardian cases from time to time.

In addition to living plants he sent over numerous specimens of economic interest for the museum collections.

It may be added that it is no doubt very largely due to Dr. Alford Nicholls' keen interest that the Dominica Botanic Garden is perhaps the most interesting in the West Indies, since he was able to support and supplement the efforts of the Curator and ensure that he received due encouragement and the necessary financial assistance from the Government authorities.

Sir Henry, both in his medical work and in his agricultural interests, followed in the footsteps of his able predecessor, Dr. John Imray, who was instrumental in establishing lime cultivation in Dominica after the failure of the coffee crop.

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ROYAL BOTANIC GARDENS, KEW

XXVI.—GOSSYPIUM. Sir George Watt.

The following observations may be described as constituting a Classified Enumeration, with brief diagnostic descriptions, of certain species of cultivated and wild cottons, specimens of which are preserved in the Herbaria of the Royal Botanic Gardens of Kew and Edinburgh.

The genus *Gossypium* may be said to have been neglected botanically, as a consequence, very possibly, of its great popularity in modern commerce, or in consequence of the opinion, at one time entertained, that all the cottons of the world constituted but one (or a very few) species. Moreover, cotton is only recently a cultivated plant, comparatively speaking, in the chief areas of its production. While that is so, there are several species that exist both wild and cultivated, and others that have never been cultivated at all, yet both sets have been entirely overlooked by botanists. It naturally follows that there are several cultivated forms more or less misunderstood because of imperfect knowledge regarding their origin.

Nothing has surprised the writer more than the importance of the Continent of Africa in a study of the genus. The present notes are accordingly intended very largely as a contribution toward a better understanding of certain African, Egyptian, and Indian cottons. They will be found to amend and amplify, and in some instances correct, the particulars given in the "Wild and Cultivated Cotton Plants of the World."

With very few cultivated plants has hybridism played a more important part than with the cottons. But whether produced by hybridisation or selection, improved stocks, directly adapted to locality or requirement, are the foremost consideration in extended or improved production. The first step in that direction is accurate knowledge of both the wild and the cultivated forms. Without that knowledge the attempted acclimatisation of foreign stocks may only retard progression.

The prevalence of hybrids greatly obscures the study of the species of *Gossypium*. In fact the value of certain characteristics may at first sight appear questionable. For example, the shape of the leaf and the degree of its segmentation ; the presence or absence of glands on the veins; the shape, cohesion and serration of the bracteoles; and the presence or absence of a fuzz on the seed, are all features which, taken individually, might be regarded as negligible, and yet certain combinations of them can be accepted

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as diagnostic of species, varieties or races. Then again a field of cotton very rarely consists of an absolutely pure stock. A plant picked up here may have no glands on the veins of the leaves, while there another may have several. Two or more forms may be grown mixed together either through ignorance, or indifference, or from the belief that the one is helpful to the other. But the one may be a splitting hybrid that manifests certain features not visible in the other—the pure dominant. That is the story of the so-called "Hindi Weed" of Egypt, which in certain of its forms throws back to *G. punctatum*, in others to *G. peruvianum*. Lastly it is probably safe to affirm that few cultivated plants are more dependent on environment than are the species and hybrids of *Gossypium*.

[The references cited below are to Watt's Wild and Cultivated Cotton Plants of the World.]

SECTION I. SPECIES WITH FUZZ BUT NO FLOSS: BRACTEOLES FREE.

G. Darwinii *Watt*, l.c. p. 68, plate 4.

GALAPAGOS. Albemarle, *C. Crossland in Riley*, 441, dated 3–8–24.

The fruits and seeds of this species are unknown to me, so that its presence in this section is open to question. I would repeat (l.c. p. 69) that at the time at which this species was collected by Darwin, cotton could hardly have been cultivated anywhere on the Galapagos Islands. *G. Darwinii* may accordingly be the survival of an ancient form that may at one time have had a wide distribution on the mainland of America. And it is interesting to add that its pollen grains approximate in size and shape closely to those of *G. vitifolium* and *G. barbadense*.

G. Stocksii *Mast.*; Watt, l.c. p. 73, plate 6.

INDIA, Sind. A wild species never cultivated: has taken no part in the production of the cottons of India.

SECTION II. SPECIES WITH BOTH FUZZ AND FLOSS: BRACTEOLES UNITED.

* *Leaves ⅔rds palmately (sometimes almost pedately) 3–7 lobed: lobes curvilinear, bristle-tipped: base distinctly cordate: and central vein only bearing a gland.*

G. arboreum *Linn.*; Watt, l.c. pp. 77, 81–91, plates 7 and 8.

Leaves broad, ovate-cordate, acute, thick, glabrescent, ⅔rds palmately 3–7 lobed; lobes curvilinear, bristle-tipped, sinuses between the lobes open and often carrying extra teeth within. *Bracteoles* ovate, acute, entire or toothed on the apex. *Flowers* purple with darker coloured claws. *Calyx* truncate or only slightly 5-angled and prominently gland-dotted. *Corolla* nearly three times the length of the bracteoles. *Seeds* with a greenish coloured fuzz, in the purer forms.

In *G. arboreum* the tendency of the bracteoles to become toothed may be accepted as a manifestation of hybridism.

Tropical Africa. *Mr. and Mrs. Broun's 1641* (1909), cultivated in the Sudan (bracteoles coarsely toothed); *A. F. Broun* (said to be *Mr. Lawrence Balls' 213–1*), Sennar Cotton; *T. Thornton* (Dec. 1913), from Ilorin Aguji, Northern Nigeria—typical; *P. H. Lamb, 3*, Ilorin, Northern Nigeria (Nov. 1912), said to be perennial tree cotton; *Imp. Inst.*, Matanka Nawa, N. Nigeria (Feb. 1913); *E. W. Foster, 188*, Obba, South Nigeria, Tree Cotton; *Imp. Inst. 48,487*, Gambaga, N. Territories, Gold Coast.

Egypt. A typical example seen in the Herbarium of Egyptian Cottons, Min. of Agri., *N. D. Simpson, C. 66*, grown at Giza from seed procured from the U. P. of India. It is somewhat remarkable that there are no recent samples of plants grown from Egyptian or African seed. The species seems more abundant on the West than the East side of Africa.

Siam and the East. *A. F. G. Kerr, 4418* (Aug. 1920), from Siam, said to be "Cultivated as an ornamental shrub"; *A. Marcan, 450* (7 Oct. 1920) Temple of Bangkok, Siam; Flora of Singapore, etc.

Var. **sanguineum** *Watt*, l.c. pp. 77, 91–95, plate 9.

Leaves broader than in the type, the lobes broader, thinner and more hairy, often not constricted below and frequently of a purple tint. *Bracteoles* very much larger and more deeply gashed. *Flowers* purple with darker patches on the claws.

This is the purple-flowered annual or biennial field crop. It is frequently hybridised with *G. Nanking* or *G. neglectum*, when the flowers become small and often pink or white.

Tropical Africa. This is sometimes spoken of as a specially African form and yet there are no examples of it in recent Tropical African collections.

Egypt. The Cotton Herb. Min. of Agri. Egypt, *N. D. Simpson, C. 93* (seed procured from the Panjab): Also the following hybrid forms (*sanguineum* × *Nanking*), *C. 78* (flowers pink with purple claws): *C. 92* and *C. 94* (seed procured from the Panjab).

India. Karnal District, Panjab, *J. R. Drummond, 22,065*; South India, *Sir A. G. and Lady Bourne, 2817* (said to be *G. obtusifolium* Roxb., var. *Nanking* Gammie); also South India, *Viscount Gough* (said to be *G. nigrum*).

Var. **neglectum** *Watt* l.c. pp. 77, 95–108, plates 10, 11 and 12. Bengal or Dacca Cotton.

Leaves very hairy, coarse, bullated, rough furrowed or corrugated; lobes 3, 5 or 7, often with supplementary teeth, linear-lanceolate, undulate, the bottom pair spreading. *Bracteoles* very large, greatly produced laterally, more than half the length of the corolla. *Flowers* often two together, usually yellow with purple claws.

In hybrid states the flower tends to become white or pink with purple claws.

JAPAN. A series of six sheets (Nos. 8, 9, 13, 14, 15, and 16) are correctly named as variety *neglectum*. These were raised at the Experimental Station of Mokpo, Chosen, from seed procured from Southern China, *S. Mihara*. The specimens are beautifully preserved but unfortunately each shows but two leaves and a flower and neither bracteoles, calyx, fruit nor seed, so that they cannot be critically discussed. As a series they are most interesting. They have lost the roughness of the Indian plant and become glabrescent, and the flowers of Nos. 13, 14, and 16 are pink or white, while the plants do not appear to be hybrids.

EGYPT. The following were grown at the Experimental station of El Giza, Cairo: *N. D. Simpson*, *C. 64*, *C. 76* and *C. 273*, all raised from seed obtained from India. They may be said to have the foliage as in *G. arboreum* but flowers yellow with purple claws and much larger than is customary: *C. 275*, flowers yellow but unusually small. The following appear to be hybrids of var. *neglectum* × var. *roseum*, *C. 63*, *C. 65*, *C. 70*, and *C. 78*: while *C. 91* is possibly a cross of var. *neglectum* × *G. Nanking*. In all these hybrids the flowers are smaller and contained within the bracteoles and white or pink with purple claws.

** *Leaves half cut into* 3–5 (*mostly* 3) *lobes, the extra pair appearing as if artificially attached, thus abnormally increasing the breadth: the lobes deltoid-oblong, acute or acuminate: base usually only slightly cordate: very frequently* 3 *veins bear glands below.*

G. Nanking *Meyen*; Watt, l.c. pp. 78, 114–124, plate 15.

Leaves broad, ovate, tending to cordate, acuminate, softly though sparsely hairy (often stellately), one-half cut into 3–5 (mostly 3) lobes, with the lobes arching upwards, deltoid-oblong, acute, acuminate, sinuses (in hybrid states) having supplementary teeth. *Bracteoles* ovate, oblong, deeply cordate, large, generally half the length of the corolla, 3–4 teeth on the apex. *Flowers* frequently large and not fully expanding, yellow or purple or white, with faint purple claws, the whole corolla turning purple with age. *Calyx* wide, loose, truncate. *Capsules* angled, ovate, acuminate, 3–4-celled. *Seeds* large, irregular, densely coated with rufous fuzz and carrying a good silky floss which shows a tendency to become khaki (red) coloured.

I employ the name *G. Nanking* Meyen (Reise, II, 1836, p. 323) in preference to *G. indicum* Lamk. (Encycl. 1786) in order to avoid the error originated by Plukenet (Alm. Bot., 1696) and continued by Lamarck, Cavanilles, Willdenow, De Candolle, etc. Moreover the name *indicum* is open to ambiguity since the plant is more Chinese than Indian.

There are many varieties and cultivated races of this plant, of which the following may be specially mentioned:—

Gossypium Nanking *Meyen*, var. **japanense** *Watt*, var. nov.

Folia magna, lata, tenuia, laevia, glabra vel glabrescentia; lobi deltoidei, acuminati, iis var. *himalayani* similes sed majores.

sinibus in plicas elevatis sed sine dentibus supplementariis. *Bracteolae* accrescentes, maximae, ovato-triangulares, acutae, dentibus 3–4 brevibus apicalibus. *Petala* flava vel alba, unguibus saepius purpureis.

JAPAN. Cultivated at the Cotton Experimental Station, Mokpo, Chosen, Japan, from Chosen seed, *S. Mihara, 10* (type).

Leaves large, broad, glabrous or glabrescent, thin, smooth; lobes deltoid, acuminate, very similar to though larger than those in var. *himalayanum* and with the sinuses thrown up in folds but apparently never furnished with supplementary teeth. *Bracteoles* becoming accrescent, very large, ovate, almost triangular, acute, and with 3–4 short teeth on the apex. *Flowers*, in a recent collection from Japan the following occur:—Nos. 2, 5, 10 and 12 the flowers are large yellow with purple claws: No. 1 not quite so large, and yellow but without purple claws: No. 3 white with purple claws but so small as to be hidden within the bracteoles: No. 6 large, pale, tinted with purple and having deep purple claws: No. 11 large, white, blotched with purple and with darker coloured claws: No. 4 flowers small, pure white.

The plant indicated may be accepted as typical of the chief cottons of China and Japan. On the labels of the above-mentioned Japanese specimens it is stated that the seed had been obtained. 10 and 11 from Japan, all others from China, and all were grown at the Experimental Station of Mokpo, Chosen.

In The Wild and Cultivated Cotton Plants of the World (pp. 123–4) I have described several Japanese and Korean cottons that differ only very slightly from the above. Plate 15, f. E. shows a portion of one of these, grown at Washington, U.S.A. An excellent specimen will be found in the Edinburgh Herbarium, supplied by the Yokohama Nursery Company Ltd., and named *G. herbaceum* Linn., also an earlier specimen collected by W. R. Carles on the West Hills of Peking, and still another, by the same collector, from Shanghai. The last mentioned comes remarkably near the Indian variety *himalayanum*.

VAR. **Bani** *Watt*, l.c. pp. 131–4.

The Berar, Hinganghat or Oomra Cottons of India.

Twigs, petioles and peduncles pilose and usually purple coloured. *Leaves* large, thin, softly pilose; lobes undulate. *Bracteoles* large, thin, membranaceous, ovate, triangular to oblong-acute, with three teeth on the apex, the central one much the largest and each bracteole having three veins usually prominent along the centre. *Flowers* much smaller than in varieties *himalayanum*, *japanense* or *Nadam*, not much exceeding the bracteoles and yellow, pink or white, usually with purple claws, vividly recalling the flowers of *G. arboreum* var. *neglectum*; the tendency to white or pink flowers would appear to be more common in China and Japan than in India.

An extensive series of samples, deposited in the Edinburgh

Herbarium, has been received from the Cotton Herbarium of the Ministry of Agriculture in Egypt, procured from plants cultivated at the Experimental Station of El Giza, near Cairo, and prepared by Mr. N. D. Simpson. The plants were raised from seed procured from India. They may be here indicated since they are instructive. They are better botanical specimens than are to be found in most herbaria and are fully illustrative of "Berar," "Hinganghat" or "Oomra" (Amraoti) cottons of Indian Commerce.

The following enumeration may be accepted as indicating these Egyptian grown *Bani* Cottons:—

C. 68. Seed procured from Bombay: approaches var. *Nadam*.
C. 69. Seed from Bombay under the name *Cutchica*: flowers small white with pink claws, probably a hybrid, *Nanking* × *neglectum*.
C. 71. Seed from the Central Provinces: plant glabrescent, a form approaching var. *Nadam*.
C. 75. Seed from the U.P.: suggestive of var. *Nadam*.
C. 80. Seed from the Panjab: flowers small pinkish-white, bracteoles large with 5–6 teeth; approaches var. *neglectum*.
C. 83. Seed from Madras under the name *Caragani II*: young leaves velvety.
C. 84. Seed from Madras: is var. *Bani* race *Mathio*: matches exactly Gammie's pl. No. 1, which he names *G. obtusifolium* Roxb.: flowers small, yellow with purple claws: bracteoles with 6–7 minute teeth: twigs, etc., glabrescent and purple coloured.
C. 272. Seed from the Panjab under the name *G. indicum*, flowers yellow.

Gossypium Nanking *Meyen*, var. **canescens** *Watt*, var. nov.

Ramuli, petioli pedunculique molliter pilosi. *Folia* 3–5-loba, tomento brevi griseo canescentia, tandem glabrescentia, lobis acutis apice setiferis deorsum leviter constrictis. *Bracteolae* magnae, ovatae, acutae, membranaceae, saepius tridentatae; glandulae interiores triangulares, glandulis epidermidis punctiformibus parvis brunneis circumscriptae. *Calyx* dentibus 5 minutis acutis. *Petala* verosimiliter purpurea. *Lana* seminum facile detergibilis, sericea, nivea.

Anglo-Egyptian Sudan. Nyonki, *Shantz, 933* (type).

Twigs, petioles and peduncles softly pilose. *Leaves* canescent, coated with a short grey tomentum, and in time becoming glabrescent: 3–5 lobed, the lobes slightly constricted downwards and apex acute, bristle tipped. *Bracteoles* large, ovate, acute, membranaceous, mostly tridentate; *glands* within triangular, outlined by small brown epidermal gland-dots. *Flowers* apparently purple coloured. *Calyx* with five minute, acute teeth. *Floss* readily separable from the seeds, pure white silky.

Tropical Africa. The form here indicated was collected by *H. L. Shantz*, at Regu (*912*) and at Nyonki (*933*), in the Anglo-

Egyptian Sudan, July 1920; by *H. Powell, 6* and *14* ("Native seed cotton"), at Gosha, Jubaland, British East Africa; by *Aug. Chevalier, 11062*, French Tropical Africa.

An African plant closely allied to the Indian *Bani* cottons and isolated more on account of geographical than botanical considerations. It would seem possible, in fact, that it may prove the wild condition of the cultivated *Bani* cottons. But in some of its forms the African plant manifests an approach to *G. arboreum* Linn. var. *sanguineum*.

VAR. **Nadam** *Watt*, l.c. pp. 78, 128–31.

Leaves 3–5–7-lobed, thick, leathery, glabrescent; lobes subtriangular, often with supplementary teeth. *Bracteoles* small, thick, sparsely toothed. *Flowers* large, bright yellow with purple claws.

In India this is known as Coconada Cotton and may be viewed as parallel with var. *neglectum* in the *G. arboreum* series. But it does not appear to be met with in Africa, its place being there taken by the two species *G. Simpsonii* and *G. soudanense*. In Egypt, recently introduced stocks of *Nadam* have been experimentally cultivated, of which mention may be made of *C. 54*, the seed of which had been supplied by Madras under the name of *Karaganni III*, and from Madras also came *C. 82*.

Mention may be here made of two specimens preserved in the Kew Herbarium that would appear to be forms of variety *Bani*, namely, that collected by *Mr. George Forrest, 15,635* in Yunnan, and by *M. le Dr. Thorel* in Cochin-China, (*Herb. Mus. Paris*). In certain respects these approximate more closely to the African wild plant for which I have ventured to assign the distinctive name *canescens*. So again in the Edinburgh Herbarium there is preserved, what is said to be a duplicate of *Forrest, 15,635*, but which I take to be a plant closer to variety *Nadam* than to *Bani*. At the same time it recalls the African wild plant for which I have suggested the name *G. Simpsonii*. It was collected (Nov. 1917) at an altitude of 6000–7000 feet and at 27° N. lat. where one might almost affirm it was beyond the area of *Gossypium*, but another variety of *G. Nanking*, namely *himalayanum*, also reaches sub-tropical conditions, in the North West Himalaya.

Gossypium Simpsonii *Watt*, sp. nov.

Ramuli, petioli pedunculique pilosi, mox glabrescentes, purpurei. *Folia* rotundato-ovato-oblonga, profunde cordata, 3–5–7-loba, fere coriacea, laevia, pallide viridia, purpureo-tincta, praesertim secus marginem undulatam; lobi lineari-oblongi, deorsum sensim constricti, sinu aperto in plicam elevato; stipulae longae, lineari-lanceolatae, acutae; glandulae inconspicuae, saepius infra nervos tres saltem; nervi utrinque prominentes. *Bracteolae* pro rata parvae, ovatae vel deltoideae, acutae, secus majorem partem marginis dentatae. *Calyx* laxe 5-angulatus vel inconspicue dentatus, venis inconspicuis. *Corolla* flava, unguibus purpureis, extra

tomentosa. *Capsula* subsphaerica, obtuse rostrata, subtrigona, 3-locularis, seminibus 6 pro loculo. *Semina* obpyriformia, lana duplici vestita, altera brevi alba densa, altera longa aspera.

AFRICA. Grown at El Giza, Egypt, from seed procured from the Siwa Oasis, *N. D. Simpson, C. 1* (type).

Twigs, petioles, and peduncles pilose but early becoming glabrescent and all purple coloured. *Leaves* ovate, oblong, rotund, deeply cordate, thick almost leathery, smooth, pale green with a purple tinge, especially along the wavy margin; 3–5–7 (often 7)-lobed, lobes linear-oblong, constricted gradually downwards with the intervening open sinus thrown up in a fold: *stipules* long, linear-lanceolate acute: *glands* obscure though usually present on at least three veins and veins of the leaf prominent on both surfaces. *Bracteoles* relatively small, ovate, acute or deltoid, toothed around the greater part of the margin. *Calyx* loose 5-angled or obscurely toothed, veins inconspicuous. *Corolla* yellow with purple claws, tomentose externally. *Fruit* subspherical bluntly beaked, inclined to be trigonous, 3-celled with 6 seeds in each cell. *Seeds* ob-pyriform. *Fuzz* white, dense. *Floss* rough.

The following may be given as good examples:—Mr. N. D. Simpson furnished not only beautiful botanical specimens (*C. 1*, dated El Giza, 8–5–22) but a detailed description and drawings of the plant, thus critically isolating it; he tells us that seed had been procured from the Siwa Oasis and grown at Giza: Mr. W. Lawrence Balls contributed, what I take to be the same plant, namely his *213–2* (dated 8th December 1906), and his note along with the specimens speaks of it as being the Senaar Tree Cotton. Anterior to these collections, Mr. C. E. Muriel furnished his *S. 51* from J. Ahmed Aga on the White Nile: Mr. S. Simpson submitted a sample of what he calls "Wild Cotton found growing freely near Humbe, Mossamedes, Angola": Mr. P. H. Lamb collected it at Kano, N. Nigeria (his *8*, 8th Jan. 1913) and describes it as a "Perennial cotton which bears in the Hausa language the name *Yerkerfi*": Mr. R. C. Andrew, 5th Jan. 1914, collected the same plant at Kano, alt. 2000 ft. and describes it as a perennial and gives it the same vernacular name already mentioned.

A widely distributed plant, in Tropical Africa, from the Sudan and the White Nile to Angola and Nigeria. Apparently a wild species, at all events it has never been recorded as met with under systematic cultivation. In some respects it might be accepted as embracing all the glabrous, or perhaps rather, the glabrescent conditions of *G. africanum*, though it has a stronger taint of *G. Nanking* and particularly brings to mind the Indian series of cottons thrown into var. *Nadam* race *Coconada*, all perennial thick-leaved plants with purple twigs and even a purple tinge on the foliage and flowers. But while the African representative would seem to be a purely wild plant, the Indian exists entirely under cultivation. Here, not for the first time, we thus get the suggestion of India

having possibly derived some of its cotton stocks from Africa, just as in a further paragraph the opinion is offered of China being similarly indebted to the great African Continent.

Gossypium soudanense *Watt*, sp. nov.

Ramuli, petioli pedunculique glabri, vel innovationes minute sparse pilosi, adulti purpurei. *Folia* magna (usque ad 7·5 cm. longa et 6·5 cm. lata) late ovata, breviter cordata, 3-5-7-loba, tenuiter herbacea, fere glabra, pallide viridia; lobi late linearioblongi, acuminati, deorsum minime tantum angustata, sinibus apertis interdum dentibus supplementariis instructis (ut in *G. arboreo*); glandulae parvae, elongatae, irregulares, infra nervos 1-3 vel plures sitae; petiolus lamina longior. *Bracteolae* per $\frac{3}{4}$ partis cordatae connatae, magnae, ovatae, deltoideae, acutae, dimidium corollae superantes, superne dentibus 3-6 acutis, sub fructu accrescentes. *Calyx* laxus; glandulae basales triangulares glandulis epidermidis numerosis parvis furvis circumscriptae. *Corolla* fulva, unguibus purpureis. *Capsula* oblonga, abrupte rostrata, 3-locularis. *Semina* magna, pyriformia, obtusa, lana duplici vestita, altera brevi densa viridi-brunnea, altera fere 2 cm. longa cremeo-alba aspera laniformi. — *G. Nanking* var. *soudanense* Watt, Wild and Cult. Cotton Pl. 123, 138 (1907).

Africa. Khartum, Soudan Country cotton, *A. F. Broun in Sudan Government Herb. 693* (type).

Twigs, petioles and peduncles quite glabrous or with the young structures minutely and sparsely hairy, the older becoming purple coloured. *Leaves* large, maximum 3 by $2\frac{1}{2}$ inches, thin, herbaceous, almost quite glabrous, pale green, broad-ovate with shallow cordature: 3-5-7-lobed, lobes broad, linear-oblong, acuminate and only very slightly tapered below, sinus between the lobes open and sometimes furnished with extra teeth (as seen in *G. arboreum*): *glands*, 1-3 or more, veins carry below small elongated irregular glands that appear sometimes above as well: *petiole* longer than the blade. *Bracteoles* $\frac{3}{4}$ united within the cordature, large, ovate, deltoid, acute, more than $\frac{1}{2}$ the length of the corolla, smooth, with 3-6 sharp teeth around the apex and becoming accrescent on the fruits. *Calyx* loose and glands at the base triangular, outlined by numerous small dark-coloured epidermal glands. *Corolla* yellow with purple claws. *Fruit* oblong, suddenly beaked 3-celled. *Seeds* large, pyriform, obtuse. *Fuzz* copious greenish-brown. *Floss* nearly $\frac{3}{4}$ inch long, creamy white, harsh, woolly.

In shape of leaf this comes nearer *G. arboreum* than *G. Nanking*. It is in fact remarkably like var. *neglectum* (the *Belati* cotton of India) but all the other features of the plant bring it into close affinity to *G. Nanking*.

Apparently a wild species, indigenous to the Soudan and East Africa: a large perennial bush.

The following examples may be cited: *Mr. and Mrs. Broun, 1134*, dated 26-6-07, from Khartum where it is said to be known

as *Beladi* cotton: their *693*, "the Sudan country cotton," a plant with the leaves deeply 7-lobed and very much like a glabrescent *arboreum* with yellow flowers and many glands: also *1099* (3–14–07) "Sudan wild cotton." This is the specimen I provisionally named var. *Brounianum* but I now think it had better be accepted as but a small leaved state of *G. soudanense*. Lastly *Dr. D. Keller, 67* (dated 1891) from Somali-Land is typical of the species.

In the Wild and Cultivated Cotton Plants of the World (p. 123) the reminder is made of the oft repeated opinion that China obtained *G. Nanking* from Africa. It is just possible that it came from *G. soudanense*.

**** Leaves less than half cut into* 5 (*more rarely* 3–7) *lobes; lobes constricted below* (*ogee-shaped*), *obtuse, or acute: base distinctly cordate: central vein only bearing a gland below and the veins gland-like extended into the cordature.*

G. obtusifolium *Roxb.*; Watt, l.c. pp. 79, 139–43, plates 19 and 20.

A large assortment of the varieties and races of this cultivated species exists in Africa and these seem to have descended from an ancient cultivation. But though several closely allied wild species have been found, no example of what could be accepted as a wild *G. obtusifolium* has as yet been recorded. Indeed one is greatly surprised, on turning from a study of the cottons of India, to find how remarkably similar they are to those of the vast Continent of Africa. We have already seen that some of the best forms of *G. arboreum* and of *G. Nanking* are not only cultivated in Africa but that a few of them exist there as indigenous or wild plants. The same experience has now to be recorded with *G. obtusifolium*. Hence it may be affirmed Africa possesses a more extensive and much more varied assortment of cotton plants than is met with in almost any other country. And it will presently be shown that the experience gained both in acclimatisation and hybridisation has been much the same in both countries.

The typical form of Roxburgh's supposed Ceylon plant may be recognised by the following:—

Leaves rotund-oblong, obtuse, base cordate but hardly auriculate, thin, smooth, compact, minutely stellately pilose: lobes more or less ovate-rotund, constricted below and emarginate. *Bracteoles* half the length of the corolla, ovate, entire or coarsely toothed, not very deeply cordate but prominently veined. *Flowers* large, convolvulate, yellow usually with large dark-purple blotches on the claws and a purple tinge on passing to maturity. *Calyx* irregular with 5 large rounded teeth. *Corolla* having a short tube, with the petals only slightly attached. *Seeds* very large, irregular, with a rusty-grey *fuzz* and the *floss* poor, reddish-white, woolly. *Fruit* 3-celled, valves as a rule completely reflexed.

As cultivated plants, the forms that have to be placed under *G. obtusifolium* manifest departures in the inflorescence, which often becomes proliferous; in the bracteoles, which remain ovate,

never assuming the rotund-reniform shape seen in *G. herbaceum*, though they frequently become deeply gashed; in the fruit often becoming 4-celled and sometimes opening imperfectly; and the seeds frequently becoming small and numerous with the floss often considerably improved both in length and texture. They are plants that manifest ready adaptation to soil and climate, and are the most valued of the Asiatic cottons.

VAR. **Wightianum** *Watt*, l.c. pp. 143–53, plates 21 and 22.

Todaro, who founded the species *G. Wightianum*, described it originally in the Osservazioni su talune Sp. di Cot., 1863, 47, where he deals with one plant only, but unfortunately in his later publication (Relaz. Cult. dei Cotoni, 1877, pp. 141–6, t. iv. f. 1–9) he grouped several specimens and made a combined description and unfortunately thereby confused the species. The main point aimed at, however, was accomplished, namely the separation of the Indian plant from *G. herbaceum* Linn.

It may be recognised by the following:—*Leaves* ovate-rotund, often coated with persistent, long shaggy hairs over a short tomentum of stellate hairs, especially on the veins below: lobes 5–7 rarely 3, ovate-oblong, acute to acuminate, with the sinuses often thrown up in folds. *Bracteoles* sometimes almost free, relatively small, ovate, obtuse or acute, deeply toothed on the upper margin and nerves prominent.

The specimens that have to be cited may best be assorted under the Races (or cultivated forms) to which they most probably belong:

(*a*) *Kahnami*:

EGYPT. Contributed by Mr. N. D. Simpson and grown under his observation at the Egyptian Government Research Station of El Giza near Cairo, namely:—*C. 72*, raised from seed obtained from Surat, India; *C. 74*, grown from seed obtained from Bombay, leaves with the lobes broader than is customary and with the central one considerably elongated, recalling *G. abyssinicum*; *C. 79*, local name "Westerns Hagari, 25"; *C. 779*, not stated where the seed had been procured but is a good cotton and comes very near the so-called Surat long staple, in fact, differs only in degree of woolliness from *72*, *74* and *79*; *C. 783*, not stated from where the seed had been procured but is perhaps the finest specimen of the series and worthy of special consideration.

TROPICAL AFRICA. In the Kew Herbarium there is a specimen collected by Sir John Kirk, during the Livingstone Zambesi Expedition, above Lupata, between Tette and the sea coast, *283*, dated 22-4-60 and named *Tonje kaja*. Attached to the specimen is the following instructive note:—

"*Tonje kaja* or native cotton, is cultivated by the people on Zambesi and up the Shiré to Lake Nyasa. It is the primary sort and exists everywhere not having been driven out completely by

the *''Manga''**. Its cotton adheres to the seed which remains woolly after being picked. It is stiff and much resembles wool. The amount yielded is less.

"The plant differs in its leaves being more divided—5-angled or lobed—few entire cordate. Involucre not much divided into segments. Corolla with purple at the base of petals."

When writing the Wild and Cultivated Cottons I formed the opinion (p. 135) that the *Tonje kaja* might be accepted as a cultivated state of the Indian *Roji* cotton. With a greatly extended series of African specimens before me, I now think a more definite pronouncement possible. I accordingly accept the *Tonje kaja* as an example of what is known in Indian commerce as Surat Cotton and very near to the *Kahnami*.

Within recent years an effort has been made to improve and extend cotton production within the British Empire, but it seems likely the fine cotton (*Tonje kaja*) here discussed had been extensively grown in East Africa long before any such steps had been taken in that great Continent. And yet the story of the introduction of *G. hirsutum*, the *Tonje manga*, is exactly parallel with the experience and results attained in India when *G. hirsutum* was introduced and crossed with the fine old cottons of Western and Central India.

(*b*) *Goghari*:

Egypt. Research station of El Giza:—*C. 791*, raised from Indian seed; also *C. 785* from Indian seed.

Tropical Africa. Collected by *T. Thornton* at Ilorin Aguji, N. Nigeria, October 1913. This remarkable plant brings to mind *G. abyssinicum*, though I think its correct position is here among the Surat cottons, but whether indigenous or introduced to Nigeria has not been stated. The bracteoles are large ovate-acute, cordate, deeply toothed, and only very slightly united; ovary 3-celled; seeds irregular with rusty fuzz and silky floss and with the beak very pronounced.

(*c*) *Lalio* or *Dhollera*:

Egypt. *C. 787*, seed procured from India and grown at El Giza. Lobes of the leaves show a tendency to become linear-oblong. In the *lalio* cottons the wool flows from the pods like the saliva from the mouth of a bull. (Confer with *G. transvaalense* below).

(*d*) *Uppam*:

Egypt. *C. 67*, Dhawar seed grown at El Giza—a typical specimen; *C. 108*, Dhawar seed raised at El Giza; this specimen gives indications of hybridism with *G. Nanking*—the lobes of the leaves are drawn out, thin and smooth, as in the *Bani* cottons, and glands are present on more than the central vein.

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* The *Manga* is *G. hirsutum*, and the comparison drawn is between that species and *G. obtusifolium*.

Tropical Africa. Dr. E. G. Irving collected a *Gossypium* at Abbeokuta in Lagos, his *2*, February 1855, a specimen of which is preserved in the Kew Herbarium. Dr. Irving made a special study of the cottons of West Africa and published in Hooker's London Journal of Botany, vii, 1855, pp. 297–302 "Notes on the Cultivation of Cotton in Western Africa." The specimen here alluded to is *G. obtusifolium* Roxb. var. *Wightianum*, race *Uppam*. Dr. Irving's specimens, descriptions and practical observations regarding the cottons and the cotton cultivation of West Africa seventy years ago are invaluable. They show intelligence and skill in no way inferior to that possessed by the Indian cultivators of the same period. And they throw a flood of light on the cultivated forms of *G. punctatum* and *G. peruvianum*.

Recently Mr. G. C. Dudgeon studied the cottons of the Gold Coast, and one of his specimens, dated 11–11–17 (preserved in the Edinburgh Herbarium), agrees very closely with Dr. Irving's plant. We thus learn that seventy years ago and to-day a cotton is being grown on the West side of Africa that represents the *Uppam* cottons, while on the East side Sir John Kirk's *Tonje kaja* takes the place of the Surat cottons.

(e) *Kanvi*.

India. *516*, collected by *Sir A. G. and Lady Bourne* at Amarapura in Madras.

(f) *Tellapathi*.

Africa. *Dr. Irving*, *33*, collected at Abbeokuta, is obviously a hybrid of *G. obtusifolium* × *hirsutum* perhaps *purpurascens*, very similar to the *Tellapathi* hybrid cottons of South India and might possibly be included under the *Manga* of Sir John Kirk.

Gossypium africanum *Watt*, sp. nov.

Ramuli petioli pedunculique graciles, teretes, breviter tomentosi, demum glabrescentes, purpurei. *Folia* rotundato-ovata, cordata, usque ad 3 cm. longa et fere 4 cm. lata, usque ad medium 3–5 (rarius 7) -loba, tomentosa margine incrassato reflexo ciliato; lobi ovati, acuti, nonnonquam setiferi et tunc saepe obtusi; lobus medius fere ellipticus in sinus acutos constrictus; stipulae parvae, lineares; glandulae inconspicuae, solitariae, saepius unica infra nervum centralem tantum. *Bracteolae* dimidium corollae haud aequantes, late ovatae, acutae, crasse coriaceae, dentibus marginalibus triangularibus, haud accrescentes. *Calyx* laxus, dentibus 5 brevibus latis abrupte acutis; glandulae bracteolis alternantes, saepe phyllis bracteolaribus propriis tectae. *Corolla* magna, flava, purpureo-maculata. *Capsula* rotundata, 3-locularis. Semina ovata, lana duplici vestita, altera brevi compacta rufo-grisea, altera longiore laniformi firme affixa.—*G. obtusifolium* var. *africanum* Watt, Wild and Cult. Cotton Pl. 153–55, t. 23 (1907).

Ngamiland. Kwebe Hills, *Mrs. Lugard, 198* (type).

Twigs, petioles and peduncles slender, round, shortly tomentose but becoming glabrescent and purple. *Leaves* ovate-rotund,

cordate, tomentose, maximum size 1¼ in. long by 1½ in. broad, half cut into 3–5 (rarely 7) lobes, the lobes ovate, acute, occasionally bristle-tipped, and then often obtuse, central lobe nearly elliptical, constricted into the acute sinuses, margin thickened, reflexed and ciliate; *stipules* small, linear; *glands* not conspicuous, one usually on the central vein below. *Bracteoles* thick, leathery, less than one-half the length of the corolla, broad, ovate, acute, triangularly toothed around the margin, not accrescent on the fruit. *Glands* on the calyx alternating with the bracteoles and often protected by bractlets. *Calyx* loose and having 5 short, broad, suddenly acute teeth. *Corolla* large, yellow, with purple blotches. *Fruit* rotund, 3-celled. *Seeds* ovate. *Fuzz* compact, rufous-grey. *Floss* short and poor, woolly, and firmly attached to the seed.

A spreading bush 3–4 feet in height, never recorded as met with under cultivation but very widely distributed in Africa from the Upper Nile to Moçambique and the Transvaal to Nigeria. Flowers apparently during the winter months.

The following examples may be cited:—*Dr. Pfund, 474*, March 1895 in Kordofan; *Mrs. E. J. Lugard, 198* (the specimen in flower in February) found on the Kwebe Hills, alt. 3000 feet, Ngamiland; *W. H. Johnson, 76 (b)* from Mutumura (has the internal glands large but naked), it flowered in January 1907, Moçambique; Livingstone, Zambesi Expedition, Mount Chiradzura, (September 1861); *Dr. A. Rehmann, 5227*, Boshveld, Kippan, Transvaal; *F. A. Rogers, 107* (in fruit July) "Growing apparently wild," Komati Poort (alt. 600 ft.), East Transvaal; *W. R. Elliott, 135* (in flower Dec. 1904), on the banks of Komadugu Waube, N. Nigeria.

Mr. W. H. Johnson drew attention to the existence of two forms of this plant in Moçambique, his *76 (b)*, which is typical *G. africanum*, and *76 (a)*, which I separate as a new variety, *bracteatum*.

Gossypium africanum *Watt*, var. **bracteatum** *Watt*, var. nov.

Caules quam in *G. africano* typico sparsius induti. *Bracteolae* majores, crassiores, grossius dentatae.

Moçambique. Between Mussuquana and Buzi, *W. H. Johnson, 76 (a)* (type).

According to Mr. Johnson, his *76 (a)* is a small compact much-branched shrub, 3 ft. high, and is evidently indigenous in Moçambique. The stems are less hairy than in typical *G. africanum* and the bracteoles larger, thicker and more coarsely toothed, all round the margin. The same variety was collected in 1894 by *M. Rautenen, 57*, in Amboland.

The variety here separated might be viewed as a hybrid between *G. africanum* and *G. Kirkii*, having the strongly marked bracteoles of the latter.

Gossypium transvaalense *Watt*, sp. nov.

Ramuli petioli pedunculique canescenti-lanati, tandem glabrescentes, purpurei. *Folia* rotundato-reniformia, cordata, usque ad 2·5–4 cm. longa et 4–5 cm. lata, 3–5-loba, velutina; lobi rotunde ovato-oblongi, acuti vel obtusi, raro setiferi, in sinus acutos constricti; lobus centralis multo maximus; stipulae breves, ovatae, acuminatae, glandula unica infra nervum centralem, sed tomento stellato saepe occulta. *Bracteolae* parvae, dimidium corollae aequantes, late ovato-reniformes vel subdeltoideae, dentibus ascendentibus vel conniventibus. *Calyx* laxus, breviter 5-dentatus vel angulatus tantum. *Capsula* rotundata, 3-locularis, post dehiscentiam subapplanata. *Semina* magna, rotundata, lana duplici vestita, altera brevi pilis intertextis, altera longiore sordide albida aspera firme affixa.

TRANSVAAL. Komati Poort, *Burtt Davy*, *369* (type).

Twigs, petioles and peduncles canescent woolly, older structures glabrescent and purple. *Leaves* rotund-reniform cordate, maximum size 1 to 1½ inches long, 1½ to 2 inches broad, velvety, 3–5-lobed the central lobe often much the largest; lobes rotund, ovate, oblong, acute or obtuse, rarely bristle-tipped, constricted into the acute sinuses; *stipules* short, ovate, acuminate; *glands* one on the central vein but often hidden by the stellate tomentum. *Bracteoles* small, half the length of the corolla, broad, ovate-reniform to deltoid, with ascending or connivent teeth. *Calyx* loose, with 5 short teeth or simply angled. *Fruit* rotund 3-celled opening nearly flat. *Seeds* large, rounded, coarse, ejected like a cascade, the seeds appearing scattered within the dirty white floss. *Fuzz* matted grey to rusty. *Floss* very inferior, dirty white, harsh, greasy in appearance, more like wire than wool or silk, firmly adhering to the seed and of no textile value.

A small bush, apparently wild—there is no record of its having been met with under cultivation. It is no doubt closely allied to *G. africanum* though much less widely distributed. The examples seen by me would appear to fix its distribution from Nyasaland to Portuguese East Africa and the Transvaal. It would seem to flower and fruit throughout the year.

The following specimens may be here recorded:—Collected by *Petherick* from the White Nile, April *1868*, "Not cultivated but probably introduced"; *W. Goetze*, *75* from Nyassa, leaves exceptionally small thick narrow lobed, suggestive of being a hybrid from *G. arboreum*; *F. A. Rogers*, *21,351* from Lourenço Marques, Portuguese East Africa; *M. T. Dawe*, *464* from Madanda Forest; *Moss and Rogers*, *6997*, from Messina; *Rogers 2647* from Komati Poort, Transvaal; *Burtt Davy*, *369*; *E. E. Galpin*, *742* from Kaap River Valley, Barberton, alt. 2,000 ft.; *H. Bolus*, *7680* from Delagoa Bay.

This botanically interesting African species has its closest affinity with *G. africanum*, though its bracteoles are reminiscent of *G. Kirkii*. According to Dawe it bears a distinctive vernacular

name *M'Gauma*, and its seeds are recognised as of value as edible nuts—facts that point to ancient knowledge. The dehiscence of the fruit and the appearance of the large round rufous seeds, floating in the scant harsh dirty useless floss, are the readiest eye-marks of the species. The wool flowing from the pod brings to mind the *lalio* cottons of India.

Gossypium abyssinicum *Watt*, sp. nov.

Ramuli petioli pedunculique dense tomentosi, saepe sublanati. *Folia* late ovata, profunde cordato-auriculata, grosse tomentosa, 3–5-loba (saepius 5-loba); lobi ovato-oblongi, acute acuminati, setiferi, deorsum angustati, interdum curvo duplici "ogee" dicto circumscripti; glandulae saepe infra nervos omnes sitae; stipulae longae, obliquae, lineari-lanceolatae. *Bracteolae* magnae, dimidium corollae aequantes, rotundato-ovatae, cordatae, profunde acute dentatae, venis tomento brevi pallido tectis itaque conspicuis. *Calyx* laxus apertus, angulatus vel obtuse 5-dentatus, venis propter tomentum conspicuis; glandulae maximae, nudae. *Corolla* flava. *Capsula* immatura abrupte rostrata, matura rotundata. *Semina* irregularia, lana duplici vestita, altera brevi griseo-rufa pilis intertextis, altera longiore facile detergibili.

Abyssinia. *Quartin-Dillon and Petit, 267* (type).

Twigs, petioles and peduncles densely tomentose, often almost woolly. *Leaves* broad, ovate, deeply cordate, auricled, coarsely tomentose, 3–5- (mostly 5) lobed; lobes ovate-oblong, the central one often much drawn out, all acute-acuminate and bristle-tipped, also tapered below till sometimes ogee-shaped; *glands* apparently present and often on all the veins below; *stipules* long oblique linear-lanceolate. *Bracteoles* large, fully half the length of the corolla, ovate, rotund, cordate, deeply and acutely toothed round the margin, and the veins made conspicuous through being coated with a short pale-coloured tomentum. *Calyx* open, loose, angled or with 5 blunt teeth, and the veins outlined by tomentum, also with the glands on the calyx very large and naked. *Corolla* yellow. Young *fruit* suddenly beaked, ripe rotund. *Seed* irregular, coated with matted grey-rufous *fuzz* and poor, easily separable *floss*.

A coarse, thick, densely hairy plant, met with in the East Sudan and Abyssinia.

The following collections may be mentioned:—*Sieber* (ex Herb. J. Gay) from Upper Egypt; *Purdy, 61*, Expedition Darfour; *Barter* from Nupe; *Quartin-Dillon and Petit, 267* from Abyssinia; *Schimper, 691* from Abyssinia, leaves more drawn out and less tomentose than is customary, may possibly be a hybrid.

This little known plant recalls very strongly the Indian *Gossypium obtusifolium* Roxb. var. *Wightianum* race *Wagria*: it is far too hairy to be accepted as a form of *G. herbaceum* Linn.

G. herbaceum *Linn.*; Watt, l.c. pp. 79, 155-63, plates 24 and 25.

Twigs, petioles and peduncles round, green, sparsely pilose conspicuously gland dotted but in some forms the stems, etc.,

become purple and the dots inconspicuous. *Leaves* almost reniform, distinctly cordate-auriculate, leathery, glabrescent on maturity, often prominently reticulate, blade less than half cut into 3–5–7 lobes; the lobes broad, ovate, rotund, suddenly acute or apiculate, irregular below thinly pilose and with the sinuses thrown up in folds; *stipules* long, linear, acuminate; *glands* on the veins below, sometimes appearing on more than the central one (an evidence very possibly of hybridism). *Bracteoles* green, broadly ovate-rotund, obtuse, only very slightly united but prominently cordate, gashed across the top into 7–9 fairly long irregular teeth, which decrease right and left. *Inflorescence* proliferous, forming many lateral spurs that carry two or more flowers, sometimes almost becoming "clustered"; stipules of the small leaves of the spurs elliptic acuminate. *Flowers* not very large but about twice the length of the bracteoles, yellow with purple claws. *Calyx* large, loose, undulate, or with short rounded teeth.

The leaves in the Herbarium dry into a pale lemon green.

A small bush often not more than one to two feet high. It is not known to exist anywhere in a wild state, though it seems probable that it is indigenous in North Arabia and Asia Minor. Its cultivation and distribution seem closely connected with the rise of the Muhammadan power. It was finally dispersed over the Mediterranean region and carried to Syria, Mesopotamia, Egypt, Persia, Afghanistan, Beluchistan and the North-West Frontier Province of India. Ultimately it was taken to the United States of America where it yielded, for a time, the "Short Staple" of that country.

The following examples may be cited:—

Egypt. Mr. N. D. Simpson has contributed an interesting series procured from the experimental Station of El Giza. These are as follows:—*C. 280* and *284*, *G. herbaceum* with a possible strain of *G. Nanking*. The plants were raised from seed procured from the Khargeh Oasis so that they may be accepted as representing an Egyptian stock. At first I thought they might prove a cultivated state of the plant I then called *G. obtusifolium* var. *africanum*, but with better material I now regard them as *G. herbaceum* hybrids. *C. 128*, same remark as above except that the seed had been procured from the Siwa Oasis. *C. 129*, *G. herbaceum* × *hirsutum* was grown from seed obtained from Malta; it bears external glands on the bracteoles within their cordature and the peduncles are sharply angled, features not met with in pure Asiatic cottons. Many of the short staple cottons of modern commerce belong to hybrids of this type. *C. 61*, *G. herbaceum* Linn., grown from seed procured from Cyprus.

Tropical Africa. It seems probable that this was one of the earliest species to be raised as an annual crop and further that it may have originated as such in Mesopotamia or Persia. It is, however, remarkable that among the extensive sets of African plants, collected during the past century, there should be no

examples of wild or cultivated *G. herbaceum*, except the Egyptian examples above indicated.

**** *Leaves less than half cut into 3 lobes, ovate-cordate; the lobes deltoid acute dentate, sinuses open; veins obscured by the tomentum; glands apparently absent.*

[It has been assumed that the seeds are fuzzy.]

Gossypium Bakeri *Watt*, sp. nov.

Ramuli petioli pedunculique tomento denso cinereo obtecti, pilis intertextis sed haud stellatis. *Folia* ovata, cordata, haud ad medium 3-loba, crassa, dense tomentosa, nervis tomento omnino occultis; lobi deltoidei, acuti, sinibus late apertis. *Bracteolae* ovato-oblongae, acutae, integrae, inferne ultra medium connatae, conniventes, multinerviae, levissime cordatae, glandulis manifestis nullis. *Calyx* brevis, cupuliformis, dentibus 5 longis triangularibus apice pilosis. *Flores* (secundum collectorem) iis *G. neglecti* Tod. similes.

India. Sind: Karachi Desert; near Gharo, *C. N. Baker* (type).

Twigs, petioles and peduncles densely coated with a cinereous tomentum, the hairs of which are matted but not stellate. *Leaves* thick, ovate, cordate, densely tomentose, less than half cut into 3-lobes; lobes deltoid acute (dentate on the leaves of the young foliage) with the sinuses between the lobes gaping open and the veins entirely hidden within the tomentum. *Bracteoles* ovate, oblong, acute, quite entire, more than half united below, thin, glabrescent, connivent (in bud closed like a bivalved shell with the margin of the outermost one turned over the others), multinerved, only very minutely cordate. No *glands* visible either internal or external. *Calyx* a compact short cup ending in 5 long triangular teeth, hairy on the tips. *Corolla*, *Fruit* and *Seed* not seen, but Mr. Baker speaks of the flower as being like that of *G. neglectum*.

Mr. C. N. Baker, January 30th, 1921, collected in the desert of Sind, near Gharo, Karachi, India, a plant which he called *Gossypium Stocksii*, a name corrected (in the Herbarium) into *G. obtusifolium* Roxb., but it is a perfectly distinct new species. The material, however, is very unsatisfactory, though a flower bud which I dissected enabled me to see certain features that are most distinctive. It is undoubtedly a wild species and was found in the Sind desert 5 miles from the nearest field and 50 miles from cotton cultivation. Moreover, it does not look as if it could have been cultivated. At all events there is no trace of its influence in any known Indian hybrid.

I have ventured to name the plant, and have associated it with the discoverer.

XXVII.—ADDITIONS TO THE INDEX KEWENSIS: VIII.*

The attention of Kew has been drawn by Mr. Alfred Rehder to the fact that K. Koch's Hortus Dendrologicus, which contains many new names, has been almost entirely overlooked. This work, which bears the date 1853, consists of xvi pages of introduction and 354 pages of text, the latter being divided into seventeen "Orders," each followed by a separate index. The introduction and pages 1–195 seem to have been issued separately in advance, judging by a copy in the Library of the Kew Herbarium. This stops at p. 195, which bears the printer's name at the bottom, page "196" being entirely blank. The copy in question formed part of Sir William Hooker's Library, and may have been sent to him by K. Koch, with whom he was in correspondence at that date.

Many combinations made by later authors first appeared in the Hortus Dendrologicus. Thus *Ampelopsis cantoniensis* K. Koch and *Benthamia disciflora* K. Koch antedate *A. cantoniensis* Planch. (1887) and *B. disciflora* Nakai (1909).

The well-known Himalayan Ivy should now bear the name *Hedera nepalensis* K. Koch (1853) in place of *H. himalaica* Tobler (1912).

The total number of names published for the first time in the Hortus Dendrologicus exceeds 100. A few, e.g. *Viburnum sempervirens*, were taken up later, either by Koch himself or by other authors, and hence were cited in the Index Kewensis. The names overlooked will be included in the seventh Supplement of the Index Kewensis.

The new names are given in the left-hand column and are followed by the page and number of the Hortus Dendrologicus and by the binary name on which they are based.

M. L. G.

K. Koch, Hortus Dendrologicus (1853).

Acer
saccharophorum 80, No. 49: A. saccharinum *F. A. Michx.* Hist. Arbr. For. Am. Sept. ii. 218, t. 15 (1812), non *Linn.*

Ampelopsis
cantoniensis 48, No. 11: Cissus cantoniensis.

Androsaemum
adenophyllum 65, No. 7: Hypericum adenophyllum.
emarginatum 65, No. 2: Hypericum emarginatum.

Anthocoma, gen. nov. (Ericac.).
aromatica 338, No. 1: Rhododendron aromaticum.

Armeniaca
minutiflora 140, No. 6: Prunus minutiflora *Engelm.*
mume 140, No. 7: Prunus mume.

Arthrocnemum
macrostachyum 96, No. 3: Salicornia macrostachya.
radicans 96, No. 2: Salicornia radicans *Guss.* Suppl. Fl. Sic. Prodr. 1 (1832), non *Sm.*

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* Continued from *Kew Bull.* 1926, p. 32.

(18914.) B 2

Aspalathoides, gen. nov. (Legumin.).
Aspalathi 242, No. 4 : Anthyllis Aspalathi.
Cytisi 242, No. 1 : Anthyllis cytisoides.
Genistae 242, No. 2 : Anthyllis Genistae.
Hermaniae 242, No. 3 : Anthyllis Hermaniae.
Astragalus
songarica 236, No. 17 : A. oligophyllus *Schrenk*.
Aurinia
leucadaea 23, No. 4 : Alyssum leucadaeum.
Benthamia
disciflora 285, No. 3 : Cornus disciflora.
Berberis
Gayi 19, No. 66 : B. brachybotrya *C. Gay*.
Brathydium
ambiguum 66, No. 4 : Hypericum ambiguum *Ell.*
aureum 66, No. 1 : Hypericum aureum *Bartram.*
fastigiatum 67, No. 8 : Hypericum fastigiatum *Ell.*
fulgidum 67, No. 10 : Hypericum fulgidum.
myrtifolium 66, No. 2 : Hypericum myrtifolium, *Lam.*
nudiflorum 66, No. 5 : Hypericum nudiflorum *Michx.* Fl. Bor. Am. ii. 78 (1803).
Rugelianum 67, No. 9 : Hypericum Rugelianum.
Cardiospermum
Loureiroi 58, No. 1 : C. Corindum *Lour.* Fl. Cochinch. 239 (1790), non *Linn.*
Cerasus
brachybotrya 147, No. 54 : Prunus brachybotrya.
microcarpa 145, No. 17 : Prunus microcarpa.
samydoides 147, No. 53 : Prunus samydoides.
Schiedeana 147, No. 58 : Prunus Schiedeana.
Chenopodina
heterocarpa 97, No. 6 : Suaeda heterocarpa.
Chronanthos, gen. nov. (Legumin.).
liparioides 248, No. 1 : Genista liparioides.
pulchella 248, No. 2 : Genista pulchella.
Villarsii 248, No. 3 : Genista Villarsii.
Clematis
Nuttalii 10, No. 27 : C. parviflora *Nutt.*
Corniola
diffusa 247, No. 11 : Genista diffusa *Ten.*
dracunculoides 248, No. 15 : Genista dracunculoides.
ferox 248, No. 17 : Genista ferox.
lucida 248, No. 22 : Genista lucida.
Melia 248, No. 20 : Genista Melia.
pontica 247, No. 3 : Genista pontica.
tenella 248, No. 16 : Genista tenella.
Cotoneaster
nebrodensis 179, No. 6 : Mespilus nebrodensis.
Crataegus
hypolasia 167, No. 17 : C. mexicana *D. Don.*
Dorycnium
pseudocytisus 240, No. 2 : Cornicina pseudocytisus.
Elaeocarpus
Zollingeri 49, No. 3 : E. japonicus *Turcz.*
Eremanthe
cordifolia 65, No. 4 : Hypericum cordifolium.
venosa 65, No. 3 : Hypericum venosum.
Euonymus
Lindleyi 212, No. 18 : E. chinensis *Lindl.*

Genistella
capitata 249, No. 1 : Genista umbellata var. capitata, *DC.*
equisetiformis 249, No. 2 : Genista equisetiformis.
umbellata 249, No. 3 : Genista umbellata, *Poir.*
Glochidium
dasyphyllum 85, No. 3 : G. molle *Hook. & Arn.*
Halimium
alyssoides 32, No. 9 : Cistus alyssoides.
calycinum 31, No. 5 : Cistus calycinus.
cheiranthoides 32, No. 11 : Cistus cheiranthoides.
coriaceum 32, No. 15 : Helianthemum coriaceum.
formosum 32, No. 10 : Cistus formosus.
pomeridianum 32, No. 14 : Helianthemum pomeridianum.
sericeum 31, No. 2 : Cistus sericeus *Munby.*
syriacum 32, No. 13 : Helianthemum syriacum *Boiss.*
ternifolium 32, No. 12 : Helianthemum ternifolium.
Hedera
nepalensis 284, No. 5 : H. Helix *Wall.* in Roxb. Fl. Ind. ii. 515 (1824) ; D. Don, Prodr. Fl. Nep. 187 (1825), non *Linn.*
Helianthemum
Jaubertii 33, No. 10 : Fumana grandiflora.
Spachii 33, No. 5 : Fumana Spachii.
Hypericum
Loureiroi 65, No. 12 : H. olympicum *Lour.* Fl. Cochinch. 471 (1790), non *Linn.*
Koniga
Lapeyrousiana 23, No. 4 : Alyssum Lapeyrousianum.
longicaulis 23, No. 2 : Alyssum longicaule.
tortuosa 23, No. 1 : Ptilotrichum tortuosum.
Laburnum
Alschingeri 253, No. 4 : Cytisus Alschingeri.
Magnolia
Sieboldii 4, No. 11 : M. parviflora *Sieb. & Zucc.*
Melia
Hasskarli 72, No. 4 : M. japonica *Hassk.*
Mespilus
mexicanus 167, No. 17 : Crataegus hypolasia.
Myriandra
adpressa 66, No. 2 : Hypericum adpressum.
rosmarinifolium 66, No. 3 : Hypericum rosmarinifolium *Lam.*
Norysca
Kalmiana 66, No. 6 : Hypericum Kalmianum.
urala 66, No. 3 : Hypericum uralum.
Opuntia
chinensis 279, No. 6 : Cactus chinensis.
Persica
cordifolia 140, No. 4 : Amygdalus cordifolia.
Pterospartum
cantabricum 243, No. 4 : Genista cantabrica.
lasianthum 242, No. 1 : Genista lasiantha.
scolopendrium 242, No. 2 : Genista scolopendria *Spach.*
stenopterum 242, No. 3 : Genista stenoptera.
tridentatum 243, No. 5 : Genista tridentata.
Pyrus
Roxburghii 183, No. 42 : P. chinensis *Roxb.*
Rhamnus
Roylei 205, No. 32 : R. rupestris *Royle.*
Ribes
chilense 275, No. 35 : R. villosum *Gay.*
longispinum 274, No. 19 : R. Grossularia *Wall.* in Roxb. Fl. Ind. ii. 515 (1824), non *Linn.*

Ribes—*continued.*
melanocarpum 275, No. 26 : R. glaciale.
monticola 276, No. 44 : R. leptostachyum *Benth.*
tomentosum 273, No. 11 : R. villosum *Nutt.*
Rosa
latispina 129, No. 85 : R. macrophylla *Wall.* Pl. As. Rar. ii. 19, t. 117 (1831), non *Lindl.*
pisifera 132, No. 113 (nomen nudum).—Armen.
Rottlera
cochinchinensis 87, No. 1 : Mallotus cochinchinensis.
Rubus
Hookeri 115, No. 91 : R. rosaeflorus, Hook.
mexicanus 114, No. 38 : R. occidentalis *Schlecht.* in Linnaea, xiii. 271 (1839), non *Linn.*
uniflorus 114, No. 35 : R. Thunbergii *Sieb. & Zucc.*
Sorbus
edulis 176, No. 5 : Pyrus edulis.
florentina 176, No. 3 : Crataegus florentina.
gracilis 178, No. 22 : Pyrus gracilis.
praemorsa 178, No. 17 : Pyrus praemorsa.
Spartocytisus
acutangulus 250, No. 2 : Cytisus acutangulus.
Sphenocarpus
pterocarpus 5, No. 1 : Magnolia pterocarpa.
Teline
Atleyana 254, No. 4 : Cytisus Atleyanus.
bracteolata 254, No. 3 : Genista bracteolata *Link.*
eriocarpa 254, No. 2 : Genista eriocarpa.
Vitis
Kaempferi 47, No. 6 : V. Labrusca *Thunb.*
Zanthoxylum
Beecheyanum 81, No. 7 : Fagara piperita *Hook. & Arn.* Bot. Beech. Voy. 261 (1836-40), non *Linn.*

XXVIII.—THE TAXONOMIC POSITION OF HOHERIA LYALLII. T. A. Sprague and V. S. Summerhayes.

In 1852 J. D. Hooker described specimens collected by Lyall and Forster in the South Island of New Zealand as a new species of *Hoheria*, *H. Lyallii*, for which he established a new subgenus, *Apterocarpa*, differing from *Euhoheria* by the carpels and styles being 10 in number and the partial fruits not being winged.

He distinguished typical *H. Lyallii*, based on a flowering specimen from hills west of Canterbury, and a variety β "foliis glabratis duplicato-dentatis lobulis acutis," based on fruiting specimens from Dusky Bay and Milford Sound on the south-west coast, and suggested that the latter might possibly represent a different species. The characters of the fruit and the name *Apterocarpa* were derived from the var. β, Hooker having assumed that typical *H. Lyallii* had similar fruits: in this assumption—which has proved to be erroneous—he has been followed by all subsequent workers.

Hoheria Lyallii has had a chequered taxonomic history, having been transferred successively to the genera *Plagianthus*, *Sida* and

Gaya by Asa Gray and Hooker, F. Mueller, and E. G. Baker respectively.

Asa Gray* suggested that *H. Lyallii* should be assigned to *Plagianthus* on account of its introrse stigmas and the total absence of wings to the fruit, and in this he was followed by Hooker†, who actually made the transference.

In 1864 F. Mueller‡ removed *H. Lyallii* from *Plagianthus* to *Sida* on the following grounds. "From various parts of New Zealand our collection possesses plants of *Plagianthus Lyallii* (Asa Gray, Botany of United States Explor. Expedition, 181), although only in a flowering state. These show the number of styles to be variable from 10 to 15 (10, 11, 13, 15), whilst the stigmata are oblique-terminal, very slightly or hardly decurrent, sometimes more curvate-clavate, sometimes so thickened as to appear capitate and to offer a transit to the more decidedly peltate stigma of *Hoheria populnea*. Thus the habit of the plant, its bisexual flowers and its stigmata mediate a clear transit to *Sida*, from which the closely allied *Hoheria populnea*, in appreciation of its winged carpels, can be also only sectionally separated, as indicated in the Fragm. Phyt. Austr. i. 29. A curious variety of *Sida Lyallii*, with small deeply incised leaves, collected by Mr. Travers and Dr. Haast in Middle Island, may be distinguished as var. *ribifolia*." He overlooked the fact that his var. *ribifolia* was typical *H. Lyallii*.

E. G. Baker§ in 1892 transferred *Plagianthus Lyallii* to *Gaya*, apparently on account of the fruits not being winged, but the absence of an internal carpellary appendage in both *H. Lyallii* and its var. β seems sufficient to exclude them from the genus *Gaya*, from which they also differ in habit. The presence of such an appendage is the salient diagnostic character of *Gaya*, not found in any other genus of *Malvaceae*.

T. Kirk tacitly treated Hooker's var. β as typical *Lyallii*, as is evident from his figure and his descriptions of the leaves and stigmas‖. He accepted Mueller's var. *ribifolia* (as *Gaya Lyallii* var. *ribifolia*). In this transposition of the type and variety of *Gaya Lyallii*, Kirk has been followed by Cockayne¶, who, moreover, has raised var. *ribifolia* to specific rank as *G. ribifolia*.

That there are two separate species is confirmed by us as a result of the examination of the material in the Kew Herbarium and of further specimens received from Dr. H. H. Allan. *G. ribifolia*, however, agrees with the type of *G. Lyallii* and should therefore be treated as an absolute synonym of the latter. It is Hooker's var. β which should be separated as a distinct species.

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* Bot. U.S. Expl. Exped. i. 181 (1854).
† Fl. N.Z. ii. 326 (1855).
‡ Veg. Chatham Isl. 10 (1864).
§ Journ. Bot. 1892, 137.
‖ For. Fl. N.Z. 279, t. 134 (1889); Stud. Fl. N.Z. 72 (1898).
¶ Trans. N.Z. Inst. 1900, xxxiii. 272 (1901).

Examination of fruiting specimens of *G. Lyallii* (*G. ribifolia*) shows that the partial fruits possess small dorsal wings, thus affording a transition between *Hoheria populnea*, which has conspicuous wings, and *H. Lyallii* var. β, in which there are none.

Comparison of the stigmas of these three species shows that in this respect Hooker's var. β is intermediate between *H. populnea* and typical *H. Lyallii*, having very slightly oblique or almost capitate stigmas, as was noted by Kirk, who in 1889 had apparently seen only var. β. The only remaining generic distinction between *Hoheria populnea* and the two other species is that of the number of carpels (5 in *H. populnea*, 10–15 in *H. Lyallii* and var. β). This gap is partly bridged, however, by *H. sexstylosa*, in which the carpels vary from 6 to 7.

Furthermore the facies of *G. Lyallii* and var. β is very similar to that of *Hoheria populnea*. We have therefore come to the conclusion that *H. populnea* (and its segregates), *H. Lyallii*, and *H. Lyallii* var. β, for which we propose the name *H. glabrata*, are congeneric, and re-assign the last two to the genus *Hoheria*, of which the generic description has in consequence to be modified considerably.

As thus circumscribed, *Hoheria* has 5–15 carpels, capitate or more or less obliquely decurrent stigmas, and partial fruits with or without wings. It has hitherto been distinguished from *Sida* by its winged partial fruits, but this distinction breaks down in the case of *H. glabrata*. *Hoheria* in fact differs from *Sida* not so much in fixed technical characters as in its different evolutionary tendencies. All the species of *Hoheria* under suitable conditions may assume the form of small trees up to 30 feet in height, whereas the species of *Sida* are herbs or undershrubs. In the possession of capitate stigmas *H. populnea* agrees with the genus *Sida*, in which this is a constant character ; but a tendency to obliquity of the stigmas occurs in other species of *Hoheria*, *H. glabrata* having obliquely capitate stigmas, while in *H. Lyallii* the stigmas are introrsely decurrent. A similar series is observable in respect to the fruit: *H. glabrata* agrees with *Sida* in its apterous partial fruits, whereas *H. Lyallii* has small dorsal wings, and this tendency reaches its maximum development in the conspicuous wings of *H. populnea*.

As regards the number of carpels, the nature of the stigmas and partial fruits, and other characters, *Hoheria populnea*, *H. sexstylosa*, *H. Lyallii* and *H. glabrata* form a series—or rather several different series—of connecting links between the genera *Plagianthus* (from which we exclude *Halothamnus** and *Lawrencia*) and *Sida*, as indicated below.

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* See Stapf in Proc. Linn. Soc. 1908–9, 9.

Genus or Species.	Carpels.	Stigmas.	Partial fruits.	Wings of fruit.	Habit.
Plagianthus	1–5	oblique	rounded, sub-coriaceous	none	Trees or shrubs
H. populnea	5	capitate	compressed, membranous	large	Trees or Shrubs
H. sexstylosa	6–7	capitate	compressed, membranous	large	Trees or Shrubs
H. Lyallii	10–15	oblique	compressed, membranous	small	Trees or Shrubs
H. glabrata	10–15	obliquely capitate	compressed, membranous	none	Trees or Shrubs
Sida	5-∞	capitate	compressed, membranous	none	Herbs or Under-shrubs

From the inspection of the above table it can be seen that it is impracticable to assign the four species here included in *Hoheria* to two or more genera, since there is no correlation between the number of carpels, the nature of the stigma, and the presence or absence of wings on the partial fruits.

The genus *Hoheria* is apparently related to *Sida* on the one hand and to *Plagianthus* on the other. Its inclusion in *Sida* as a section or subgenus, although perhaps theoretically justifiable, would involve the reduction also of *Plagianthus* and allied genera, and would serve no useful purpose. *Plagianthus* differs from *Hoheria* mainly in the shape and texture of the partial fruits, and in the small, more or less unisexual flowers.

Hoheria *A. Cunn.* in Ann. Nat. Hist. iii. 319 (1839); emend. Hook. f. Fl. N.Z. i. 30 (1852).

Arbores vel frutices foliis deciduis. *Carpella* 5–15; stigmata capitata, oblique capitata vel introrse decurrentia. *Fructus proprii* compressi, membranacei, dorso alati vel exalati.

Sect. I. **Euhoheria** *nob.*—*Hoheria* subgen. *Euhoheria* Hook. f. l.c.

Folia argute dentata vel serrata. *Carpella* 5 vel 6–7; stigmata capitata. *Fructus proprii* conspicue alati.

Species: *H. populnea*, *H. sexstylosa*, etc. The section *Euhoheria* is in need of revision, as the status of several of the supposed species is doubtful. This revision, however, could only be done satisfactorily by means of combined ecological and herbarium study.

Sect. II. **Apterocarpa** *nob.*—*Hoheria*, subgen. *Apterocarpa* Hook. f. l.c.

Folia crenata vel crenato-serrata. *Carpella* 10–15; stigmata oblique capitata vel introrse decurrentia. *Fructus proprii* inconspicue alati vel exalati.

Species: *H. Lyallii*, *H. glabrata*. Under International Rules, the name *Apterocarpa* has to be retained, although the group now includes a species with *winged* fruits. Subgenera and sections are of the same "rank," so far as Art. 49 is concerned, hence the treatment of *Apterocarpa* as a section does not warrant changing the name. The two species may be distinguished as follows:—

Folia duplo-vel triplo-inciso-crenata, supra stellato-pubescentia. Stigmata introrse decurrentia. Fructus proprii inconspicue alati .....1. *H. Lyallii*

Folia duplo-crenato-serrata, supra glabrata. Stigmata oblique capitata vel fere capitata. Fructus proprii exalati .....2. *H. glabrata*

1. **Hoheria Lyallii** *Hook.* f. Fl. N.Z. i. 31, t. 11, ram. flor. et fig. 1–4 (1852); A. Gray, Bot. U.S. Expl. Exped. i. 181 (1854), in obs.

Plagianthus Lyallii A. Gray ex Hook. f. Fl. N.Z. ii. 326 (1855), in obs.; Hook. f. Handb. N.Z. Fl. 30 (1864).

Sida Lyallii F. Muell. Veg. Chatham Isl. 11 (1864), quoad syn.

S. Lyallii var. *ribifolia* F. Muell. l.c.

Gaya Lyallii E. G. Baker in Journ. Bot. 1892, 137, quoad syn.

G. Lyallii var. *ribifolia* T. Kirk Stud. Fl. N.Z. 72 (1898); Cockayne in Trans. N.Z. Inst. 1900, xxxiii. 269 (1901); Cheeseman Man. N.Z. Fl., 1135 (1906).

G. ribifolia Cockayne l.c. 272, in obs.; Cockayne Veg. N.Z. 182 (1921) (Engler & Drude, Die Vegetation der Erde, xiv).

Plagianthus ribifolius H. H. Allan in Journ. Ecol. xiv. 78 (1926), in obs.

Arbor, 3–10 m. altus. *Rami* teretes, longitudinaliter rugosi, juventute stellato-pubescentes, demum glabri, cinereo-brunnei, cicatricibus foliorum delapsorum notati. *Folia* ovata, apice breviter acuminata vel acuta tantum, basi cordata vel rotundato-truncata, 3–9 cm. longa, 2–5 cm. lata, chartacea, duplo- vel triplo-inciso-crenata, saepe sublobata, crenis obtusis vel rotundatis, supra stellato-pubescentia vel glabrescentia, subtus praecipue ad nervos dense stellato-pubescentia; petioli graciles, supra canaliculati, stellato-pubescentes, 1–4 cm. longi. *Flores* axillares, fasciculati, 2–3-ni; pedicelli 1–3 cm. longi. *Calyx* cupularis, 5-lobus, 7 mm. longus, extra dense stellato-pubescens, intus glaber; lobi subdeltoidei, acuti, 3 mm. longi. *Petala* 5, breviter unguiculata, obovata, integra, alba. *Stamina* circiter 50; tubus stamineus 7 mm. longus; filamenta propria 3–5 mm. longa. *Carpella* 10–15, pubescentia; stylus in toto 12 mm. longus; pars communis 3 mm. longus; rami 9 mm. longi, longe stellato-pilosi; stigmata introrse decurrentia. *Fructus proprii* dorsaliter alati, ala 1·5–2·5 mm. lata.

South Island of New Zealand. Canterbury, *Lyall* (type); Valley of the Hinds near sources, mountain-sides, 450–600 m., February 1864, *Haast* 96; Awatere, 1860, *Sinclair*; Prov. of Canterbury, 1860–61, *Sinclair* and *Haast* 63; Canterbury Distr. Mt. Torlese, foot of river-terrace, 600 m., March 1901, *A. H. Cockayne in Herb. H. H. Allan* 6480.

2. **Hoheria glabrata** *nob.*, sp. nov.

H. Lyallii var. β Hook. f. Fl. N.Z. i. 31, t. 11, ram. fruct. et fig. 5–6 (1852).

Sida Lyallii F. Muell. Veg. Chatham Isl. 11 (1864), excl. syn.

Plagianthus Lyallii Hook. f. Bot. Mag. t. 5935 (1871): T. Kirk For. Fl. N.Z. t. 134 (1889); H. H. Allan in Journ. Ecol. xiv. 78 (1926).

Gaya Lyallii T. Kirk, Stud. Fl. N.Z. 72 (1898), excl. var. *ribifolia*; Cockayne in Trans. N.Z. Inst. 1900, xxxiii. 271 (1901); Cheeseman, Man. N.Z. Fl. 80 (1906); Cockayne Veg. N.Z. 182 (1921) (Engler & Drude, Die Vegetation der Erde, xiv); Gard. Chron. 1911, ser. 3, l. 56, fig. 27; et l.c. 226, cum ic. suppl.

Arbor, 3–10 m. altus. *Rami* teretes, longitudinaliter rugosi, brunnei, cicatricibus foliorum delapsorum notati, juventute sparse stellato-pubescentes, demum glabri. *Folia* ovata vel lanceolato-ovata, apice acuminata, basi manifeste cordata, 5–12 cm. longa, 2–7 cm. lata, subcoriacea, margine duplo-crenato-serrata, dentibus obtusis vel acutis apiculatis, utrinque glabrata vel rarius sparse stellato-pilosula; petioli graciles, supra canaliculati, 2–7 cm. longi. *Flores* axillares, fasciculati, 2–3 (–5)-ni; pedicelli 2–3 cm. longi. *Calyx* cupularis, 5-lobus, 5–7 mm. longus, extra dense stellato-pubescens, intus glaber; lobi subdeltoidei, acuti, 3–4 mm. longi. *Petala* 5, breviter unguiculata, obovata, integra, alba. *Stamina* 40–45; tubus staminеus 5–7 mm. longus; filamenta propria 4–6 mm. longa. *Carpella* 10–15, pubescentia, 3 mm. longa; stylus in toto 10 mm. longus; pars communis 3 mm. longus; rami 6–7 mm. longi, longe stellato-pilosi; stigmata plus minusve oblique capitata. *Fructus proprii* exalati.

South Island of New Zealand. Milford Sound, *Lyall* (type); Otago, Lake District, often forming a fringe around the Birch forest, fl. Jan. 1863, *Hector and Buchanan* 1; Slope of Mt. Martins, subalpine vegetation, 840–1200 m., March 1866, *Haast* 21; Brabourne near Murchison, margin of forest, by stream, Jan., 1925, *H. H. Allan*; Wairau*, 1860, *Sinclair*; Hurumui†, 900–1200 m., *Travers*.

Travers' specimen from Hurumui has the under surface of the leaves very densely pubescent, differing in this respect from the other material referred by us to *H. glabrata*.

* The only place named "Wairau" which we have been able to find is in Marlborough Province, but this is outside the normal distribution of *H. glabrata*. Sinclair, however, visited this district in 1860.

† Probably identical with Hurunui R. in Amuri Distr., Canterbury Prov.

Postscript.—After the foregoing account had gone to press a paper by Dr. H. H. Allan entitled "Epharmonic response in certain New Zealand species, and its bearing on taxonomic questions" appeared in the Journal of Ecology, vol. xiv. pp. 72–91 (1926). In this he deals shortly (p. 78) with *Hoheria Lyallii* (as *Plagianthus ribifolius*) and *H. glabrata* (as *P. Lyallii*) as follows :—

"The distribution of the species is remarkable: *P. Lyallii* is apparently confined to regions of the South Island exposed to the great western rainfall; *P. ribifolius* occurs in the eastern mountain region, beyond the limit of western rainfall. Cockayne says (Trans. N.Z. Inst., 1900, xxxiii. 272), 'It is ecologically of extreme interest that a character seemingly so trivial as a slight variation in hairiness of leaf has led to these two species not having inter-mingled, although they approach in places to within only three or four miles from one another at the most; and it shows, moreover, how an apparently unimportant character may govern the climatic distribution of a plant. It may also be pointed out that both forms thrive equally well side by side in lowland gardens where the rainfall is slight, and the characters of each, so far as I have been able to ascertain, remain unchanged.'

"Now *P. ribifolius* is a plentiful plant on Mt. Peel, forming groves at elevations above the general forest line, and descending as occasional plants into the forest of the upper plains. The forest is true rainforest, and the environment perfectly suited to *P. Lyallii*, but it does not occur. In dense shade by the sides of streams the Mt. Peel plant, elsewhere typical *ribifolius*, becomes a shrub the leaves of which are almost identical with those of *P. Lyallii*, being much more acuminate, and having the pubescence practically confined to the veins. Rarely one finds specimens showing both forms of foliage. It would seem that research is required to determine whether we are not, after all, dealing with a species sufficiently plastic to adapt itself to the very different conditions of habitat in which the two forms grow. It may be that we have here an example of an epharmonic variation that has become fixed, or almost so, but the question as to the taxonomic status of the two forms seem still open."

As has been pointed out above (p. 218), the differences between the two species are not confined to the leaves, additional diagnostic characters being afforded by the stigmas and fruits. These latter differences do not seem to afford any support to Dr. Allan's suggestion that in the case of *H. Lyallii* and *H. glabrata* we are dealing with epharmonic variations of a single species. The problem, however, is one which can only be solved in the field.

XXIX.—MISCELLANEOUS NOTES.

Retirement of Mr. John Masters Hillier.—On March 31st last Mr. J. M. Hillier retired from the post of Keeper of the Museums of the Royal Botanic Gardens, Kew, under the age limit. Mr. Hillier came to the Royal Gardens from the Kew Observatory in

1879, and for twenty-two years was assistant to Mr. J. R. Jackson, then Keeper of the Museums. In 1892 he was placed on the permanent establishment as an Assistant and, when Mr. Jackson retired, in 1901, Mr. Hillier was appointed Keeper.

During the forty-seven years Mr. Hillier has been at the Museums the collections have increased continuously and, despite the extension of Museum No. III and the addition of Museum No. IV during that period, the buildings have proved quite inadequate to accommodate suitably the material which has now been assembled. This increase has been due not only to the presentations that normally occur but also to the considerable acquisitions from the Imperial and International Exhibitions that have taken place since Mr. Hillier assumed charge of the Museums.

Mr. Hillier has served under four Directors and for the last year of his service has held the record of longest service on the staff of the Royal Botanic Gardens.

In succession to Mr. Hillier the Minister of Agriculture and Fisheries has appointed Mr. W. D. DALLIMORE to be Keeper. Mr. Dallimore has been a member of the Kew Staff since 1891 and an Assistant in the Museums since 1908.

The following appointment has been made by the Secretary of State for the Colonies:—Mr. R. V. D. WHITE, to be a Produce Inspector, Nigeria.

The Rottler Herbarium.—Some time prior to 1872 Mr. (now Sir) William Thiselton-Dyer and Mr. Trimen, while working on the herbarium of King's College, London, brought to light Dr. Rottler's herbarium collected in Southern India between 1798 and 1805. This had been stored in a special large table-press but left unmounted, and had not been used for a considerable period. How the collection came to King's College has not been ascertained, but it is thought that it had been obtained by Professor Henfrey, who was Professor of Botany at King's College from 1853 to 1859.

In 1872, when Sir Joseph Hooker invited his help in the preparation of the Flora of British India, Mr. Thiselton-Dyer brought this herbarium to Sir Joseph's notice and indicated its value for the purpose of the flora as it contained several type specimens with original holograph descriptions. At Sir Joseph's request the Council of King's College generously agreed to transfer the collection and 1,918 specimens were received and incorporated in the Kew Herbarium.

In 1924 Professor R. R. Gates, Professor of Botany at King's College, mentioned in the Annual Report of the Delegacy of the College that he had discovered further specimens of Rottler's which had become separated and left behind when the bulk of the collection was transferred to Kew in 1872. Sir William Thiselton-Dyer called the attention of the Director to this report, and on his application to the Council of King's College they agreed that the intention of the

Council in 1872 was to transfer the whole of the Rottler Herbarium to Kew. In consequence the residue of the collection, amounting to some 200 specimens, has been received and incorporated in the Kew Herbarium.

Plants from the Pyrenees.—The Rev. E. Ellman has kindly contributed a further collection of 290 Herbarium specimens, collected in the Pyrenees (*K.B.* 1925, p. 41). Mr. Ellman kindly invited Mr. N. Y. Sandwith, one of the temporary botanists at present engaged on the work of the Herbarium Store, to accompany him on his travels on the French side of the Eastern Pyrenees, last June. The collecting began with a week in the hot Tet Valley region (alt. 1,500–3,500 ft.) round Vernet and Villefranche, the flora of which combines Pyrenean with Mediterranean elements, and possesses a number of local species which, at least in France, are largely confined to the Pyrénées Orientales. The ground was well worked a century ago by Bentham and by Endress, who gathered many of the Villefranche plants in his 'unio itinerario.' The more noteworthy finds included *Dianthus serratus* Lapeyr., *Buffonia perennis* Pourr., *Lathyrus cirrosus* Ser., *Galium maritimum* L., *Kentranthus angustifolius* DC., f. *Lecoqii* Jord., *Achillea chamaemelifolia* Pourr., *Campanula speciosa* Pourr., *Antirrhinum Asarina* L., *Scrophularia alpestris* Gay, *Teucrium aureum* Schreb., *Lamium flexuosum* Ten., *Paronychia serpyllifolia* DC., *Rumex Acetosa* L., 'race' *papillaris* Boiss., *Thymelaea dioica* All., *Orchis coriophora* L., subsp. *Martrini* Timb.-Lag., and *Dipcadi serotinum* Medic.

The following week was spent at a much higher altitude (5-9,000 ft.) at Mont Louis, where *Gentiana pyrenaica* was seen in perfection; and the remaining three days in the Ariege Valley between the Col de Puymorens (where the road rises to 6,000 ft. near the borders of Andorra), L'Hospitalet and Ax-les-thermes. The more unusual plants in this district and at Mont Louis were *Draba nemorosa* L., *Oxytropis Lazica* Rouy, f. *Foucaudi* (Gill.) Rouy, *Lathyrus luteus* Peterm., subsp. *hispanicus* Rouy, *Saxifraga geranioides* L., *S. mixta* Lapeyr., *Eryngium Bourgati* Gouan, *Angelica Razulii* Gouan, *Erigeron frigidus* Boiss., *Carduus carlinoides* Gouan, *Willemetia apargioides* Cass., *Pedicularis mixta* Gren., with *P. pyrenaica* Gay, *Plantago monosperma* Pourr., *Scilla Lilio-Hyacinthus* L., *Gagea Soleirolii* F. Schultz, and *Luzula glabrata* Desv., var. *Desvauxii* (Kunth) Buch.

University of Sydney.—We learn with interest of the official opening of the new buildings of the Botany School, of the University of Sydney, on the 6th of November, 1925. The present School of Botany was created in 1913, and the Chair of Botany, established in the previous year, was filled by the appointment of Dr. A. Anstruther Lawson to the post of University Professor of Botany. During the years 1913–1916 classes were conducted in the Fisher Library, the Medical School and the Geology Department. These

arrangements proved inadequate and inconvenient, and temporary additional quarters were provided in 1916 in part of the Macleay Museum.

A fine new stone building was completed last year which provides adequate accommodation for the Botany School. The style is a modern version of perpendicular Gothic, in harmony with the main University Building and Great Hall, with which latter it forms two sides of a turfed garth. This garth is being laid out in a formal manner in keeping with the main approach to the University, and utilising such features as a lawn, a playing fountain and a small Botanic Garden. On the eastern facade the purpose of the building is indicated by the names of Robert Brown, Darwin, Mendel, and Hofmeister, inscribed on heraldic shields, supported by grotesques terminating the main buttresses.

The new building, the orientation of which has been especially designed to meet the requirements of botanical study and research, contains the following:

1. The Bentham and Hooker Botanical Museum, which will contain the teaching collection of museum specimens and living plants.
2. The John Ray Herbarium, fitted with cabinets for the preservation of some 10,000 herbarium specimens of Australian plants.
3. The Darwin Laboratory, with accommodation for thirty advanced students, equipped for advanced teaching and for training in methods of research.
4. The Robert Brown Research Laboratory, for students in their fourth year.
5. The Joseph Banks Laboratory, seating 135 students, for the training of First Year students in Science, Arts, Medicine, Agriculture and Pharmacy.
6. The Library and Reading Room.
7. Several smaller research rooms for members of the staff and for research students.
8. A Lecture Theatre, capable of seating 200 students for first year lectures in Botany.
9. The Physiological Laboratory.

The number of students from the various faculties attending classes in Botany during the last decade is given as 3,153, a yearly average of 315 students.

The opening ceremony was performed by the Vice-Chancellor, after which a short address was given by the Professor of Botany, Professor Anstruther Lawson. Exhibits were arranged in the new Laboratories and Museum.

Balata.—The Report of the Department of Science and Agriculture, British Guiana, for 1924 records some interesting statistics on the growth of the tree (*Mimusops bidentata* DC.), from which Balata is obtained (*K.B.* 1911, p. 198). The records are from trees planted for experimental purposes at Issorora. The mean rate of growth

has been slow, the average annual girth increments being 1·85 inches, the maximum 2·62 inches and the minimum 1·17 inches. The minimum girth at which trees are allowed to be tapped in the Colony is 36 inches measured at a height of 4 feet 6 inches, and it is estimated that the trees of the experimental crop will on the whole take 30 years to attain this size. About half of them may be of the required size when 20 years old, others when only 14 years. It is considered, therefore, that plantations of Balata trees will require 15 years after planting out before tapping can be begun.

Smoke.—This extremely interesting book* contains a summary of many years' work on atmospheric pollution in all its aspects. Most of the original research has been conducted at Leeds, where the daily soot-fall is estimated at 1 ton per square mile per day. It is pointed out that soot is not pure carbon but contains many other substances, noteworthy amongst which are tar and acids (especially sulphurous and sulphuric). Soot from the glass roofs of Kew and Chelsea gardens contained nearly 5% of SO_3. Since domestic soot has a larger percentage of tar and consequently a greater adhesive property than that derived from industrial concerns, the damage to buildings and vegetation is probably mainly due to the domestic fire-place. Vegetation is very sensitive to a polluted atmosphere and conifers appear to be most sensitive of all plants. The tar products block up stomata and form a film reducing the available sunlight, while the acids have a corrosive effect. Experiments with radishes, lettuces, spring cabbages, and wallflowers, grown in localities with different degrees of air pollution, very clearly showed the effects of such on plant growth. Soil itself is changed, the acids neutralizing the calcium carbonate. This reduces the fertility by retarding the necessary ammonical fermentation of the soil humus, and even more by lowering the activity of the nitrifying and nitrogen-fixing organisms in the soil. It was also shown by experiments with timothy grass that the continued application to the soil of acid rain produces a grass distinctly poorer in protein and richer in fibre, and consequently less nutritious, than when pure or neutralized water was used. The presence of smoke contamination is usually made manifest by an increased sulphur content in the leaves of trees and plants. Details are given on the plant and general vegetation as an index of smoke pollution, on the formation, constitution and influence of fog, and on the effect of smoke on buildings and health.—

W. B. T.

A New Hybrid Conifer.—*Kew Bulletin* 1926, p.114, line 42, for 21 cm. read 21 mm.

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* Smoke, a study of town air, by J. B. Cohen and A. G. Ruston. London: Edward Arnold & Co. 1925. New enlarged edition, pp. vii and 108, pl. 14. Price 8*s*. 6*d*.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1926
ROYAL BOTANIC GARDENS, KEW

XXX.—AFRICAN LEATHER DYES. J. M. Dalziel.

The original "morocco" of the Moors in Spain and North Africa was a sumach-tanned goat-leather, which was dyed red—before the tanning—with kermes, using alum as a mordant. Hausa or Kano leather tanned with "sant" pods (*Acacia arabica* Willd.), is very similar to genuine "morocco," which is now closely imitated in calf and sheep-skins with machine printing or embossing to impart a finished grain to the surface. The goat-skins of Sokoto, the north-western district of the Northern Provinces of Nigeria, are locally regarded as superior to those of Kano and fetch a higher price in native markets, but they tend at present to find their way to America rather than to Europe.

A question raised in Parliament a few months ago elicited the reasons why our legislators sit on green "morocco" of European origin instead of on material of a similar nature contributed by Nigeria or other countries of the Empire. Nigerian skins average too small for furniture purposes, and comparatively few of those produced by the native are free from blemishes. These are mainly due to unskilled flaying and unhairing or to careless methods of tanning. The native leather worker is now being educated by the representatives of the various European and American firms interested in the product, so that if these fundamental defects can be remedied the extra durability of Nigerian leather might establish it, even as an upholstery "morocco," in the home market, where it is already valued for other purposes.

Another point requiring consideration is that the colour, or rather the depth of shade shown by red Nigerian leather varies very greatly. It should be mentioned that each hide is dyed separately, and this fact alone would account for the wide range of shade which results as compared with European methods in which numbers of skins are dyed together. Various degrees of texture and porosity of the individual skins also permit of great differences in the absorption of the dye.

Nigerian leather is in itself superior in wear, and when prepared under improved conditions, it should be at least equal in appearance to European "morocco."

The account here given of native methods of dyeing leather in Nigeria is based upon personal observations recorded some years ago, amplified by more recent notes sent by Dr. B. Moiser, of the West African Medical Service.

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Red Hausa Leather.

The most familiar colour in which native goat-leather appears in Nigeria is red. For red leather either coarse skins or comparatively fine ones are used.

The two chief sources, perhaps in practice the only two, of this colour as applied to leather are (1) a red variety of *Sorghum guineense*, known as " karan dafi," and (2) aniline dyes.

" Karan dafi " is the Hausa name applied to a cultivated variety of *Sorghum* possessing leaf-sheaths and sometimes part of the stem tinged a deep red-purple colour. It is properly *Sorghum guineense* Stapf var. *robustum* Stapf. In the Upper Nile region the same material is said to be called " sikhtiyan," and other names at present in use amongst certain tribes of the Bahr-el-Ghazal are " bell " and " yunde." Chevalier * gives various native names from the French territories, of which the best known are " fara oro " in the Upper Niger region, and the Bambara " diélicanion " in western Senegal.

This colouration of the leaf-sheaths and stems, in lesser degree, often affects some of the wild species of *Sorghum*. For instance in *S. arundinaceum* Stapf, one of the gigantic grasses of Africa, the leaf-sheaths are not uncommonly more or less deeply flushed with a wine-red or deep purple stain ; in *S. aterrimum* Stapf, known from French Guinea and from the Nile region, the leaf-sheaths are " strongly blotched or flushed with blackish-purple ; ligules . . . blackish-purple ".†

In addition a considerable proportion of the African species exhibit leaf-blades which are frequently enough tinged, blotched, or spotted in various degrees with red and purple. I have seen a native collecting the deeply-stained sheaths of *S. arundinaceum* ostensibly for use as a substitute for, or to mix with, the cultivated article.

" Karan dafi " is a grass, with erect contracted panicle, deeply-stained glumes and red grains, and has the general appearance of certain forms of Guinea Corn (chiefly *S. guineense*), the staple cereal of the open lands beyond the forest, but it is cultivated solely as a dye-plant and as such chiefly for leather, with occasional medicinal uses. The grain, indeed, is said to cause unpleasant symptoms if given to animals. Its cultivation in West Africa is mostly domestic around native dwellings, not in large fields, and it may be found all over the Western Sudan from French Guinea to Bornu.

The Hausas sometimes distinguish a " karan dafi bakki " (*i.e.* black), and a " karan dafi jaje " or " ja " (red), the former being the sheaths in their full development of dark black-purple colour, and the latter the same less mature or mixed with leaf-blades which may be more or less uniformly red or blotched. In the market the material appears as handfuls or small tied up bundles each containing 4–6 sheaths.

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* Revue de Botanique Appliquée, 1924 : 352.

† Stapf in Flora Trop. Afr. 9, 1 : 121.

The native method of application is as follows :—

1. A watery extract of wood ashes, known in Hausa as " toka," is prepared. In Sokoto at least, and perhaps in general amongst the Hausas and in Bornu, the wood of " marike " (*Anogeissus Schimperi* Hochst.), is preferred, and the ashes mixed with water are allowed to stand for 3 to 4 hours.

2. The dyestuff " karan dafi "—the red leaf-sheaths of *Sorghum*—pulverised in a wooden mortar, is placed in a large vessel in which the dyeing is carried out. A little of the " toka " water is added from time to time and diluted with plain water as desired, a crimson liquid being obtained.

3. The tanned hide has been previously dressed with oil, either ground nut oil or palm oil, and sometimes shea butter is used.

4. The dyeing may be done in one of two ways. The hide may be immersed, folded with the tanned side outwards, and manipulated in the large vessel for a minute or two, after which it is wrung out and shaken. On the other hand the dye-liquid may be merely painted with a brush or rubbed with the fingers on to the tanned surface.

5. The hide is then rinsed in cold water, which has been acidulated with lime juice, or in water in which tamarind pulp has been macerated for a few hours. After the hide has been hung up to dry, the process is completed by rubbing with a smooth stone on a wooden block.

It is estimated that a quart of the dye-bath is sufficient for about six skins of medium size.

The following native method was reported to me by a European who had witnessed it in Lagos. The ingredients were :—About 30 leaf-sheaths of " karan dafi " ; about a dessert-spoonful of " potash " (meaning the Hausa " kanwa " and therefore properly natron, see below) ; a handful of " sant " pods (*Acacia arabica*) ; two table-spoonfuls of palm oil ; two bottles of water (about $1\frac{1}{2}$ pints). These were all mixed together and boiled. The addition of the juice of 5 or 6 limes naturally caused the ebullition of gas. The mixture was allowed to simmer for an hour or two, and was then ready to apply by brushing or rubbing on to the surface of the prepared skin. When dry it was further rubbed smooth by a stone or by pressing and drawing against an upright block of wood. In the absence of " sant " pods in Lagos, chips of mangrove bark—about 2 handfuls—were an available substitute.

In Bornu the wood-ash lye is replaced by " kanwa," which is the Hausa name for a sort of mineral salt, found as a natural deposit chiefly in the Manga district of the French Sudan north of Lake Chad. Amongst Europeans this is loosely classed with several other native salts as " potash," but it consists largely of sodium carbonate and bicarbonate and is therefore a natron.

In Senegal, according to Dumas* and Chevalier†, the extraction of the dye is by prolonged maceration of the sheaths in water, and a

* L'Agric. Prat. Pays Chauds, 5, 1 : 461.

† Rev. Bot. Appl. 1924 : 353.

mordant of vegetable ash is used in applying the dye-bath to the material to be treated. Presumably the maceration would be expedited by a preliminary boiling. In the Hausa method the alkaline lye serves both to extract the dye from the pulverised raw material and as a mordant in one operation.

The chemical constitution of the vegetable ashes called by the Hausas "toka," if this were prepared always from the wood of the same species of tree, might be expected to be fairly uniform. The soluble constituents of wood-ashes are generally represented as mainly potassium carbonate along with sodium carbonate and smaller amounts of potassium chloride and sulphate, while amongst the insoluble contents quicklime (CaO) often occurs in considerable quantity. Tropical woods, on the other hand, often yield an ash rich in potassium nitrate. Again, "toka" in Northern Nigeria is sometimes made by burning the sludge from indigo dye-pits or other refuse from the dyeing and tanning industries, generally mixed with the wood of *Anogeissus* or of one or other species of *Acacia*. Thus the lye from the native crude material may vary considerably in chemical content.*

The active dye-stuff of "karan dafi" has been stated to be of the same type as that of the so-called "insoluble red-woods" such as red sandal-wood and the African red-woods (*Baphia nitida*, *Pterocarpus Soyauxii*, *P. Osun*, &c., *K.B.* 1906, p. 373; 1910, p. 329), viz. "santalin" or "santalic acid." It is easily extracted from the pulverised leaf-sheaths by alcohol, giving on evaporation a very dark-red powder. If acidulated alcohol is used the resulting extract is a more brilliant and attractive red.

The action of the alkali used in preparing the dye necessarily modifies the shade, probably in the direction of violet, but the original red is restored by the dilute vegetable acids of the native process. Again, the alkali, whether from vegetable or mineral sources, doubtless forms the mordant in the above process, and as purity of these materials is on the whole unlikely the resulting tints may lack uniformity. Particularly is this likely to be the case where the water itself varies in chemical quality. Thus in Sokoto some of the wells are believed to tap the limestone, while elsewhere a ferruginous element is common; neither lime nor iron as an ingredient in the solvent water is favourable to the extraction of a perfect red dye. On the other hand as a mordant the presence of iron in the water might be of considerable importance in altering and fixing the tint. Possibly some such differences account for the statement of Volkens†, referring to "karan dafi" as used in

* A white alkaline powder sent from Bornu in 1910 to the Imperial Institute as a sample of "toka" was found to contain, besides about 66 per cent. of silica, chiefly quicklime—18·45 per cent. (Bull. Imp. Inst. 1910: 403). An excess of inert silica in the form of sand might be expected from the refuse of indigo dye-pits and from the use of muddy water. There was a complete absence of soluble alkali and the sample was probably spent "toka" from which all the soluble lye had been extracted by its previous use.

† Notizbl. Bot. Gart. Berlin, App. 22, 3: 71 (1910).

Togoland, that the extract used alone dyes red but with " trona " (which is the same as " kanwa "), it stains black.

Many species of *Sorghum* have the inflorescence, glumes and grains more or less deeply tinged from wine-red to black-purple. This natural pigment has been called " sorghorubin," and is probably the same as that of the leaf-sheaths. It can be extracted by cold alcohol or by boiling water, in either case colouring the solvent garnet-red, or by acidulated boiling water, giving orange-red. It is also soluble in alkaline solutions, giving different colours, violet, &c. The dye thus extracted can be used with different mordants to give various shades. This colouring matter, obtained particularly from the saccharated varieties, has been subjected to practical investigation in France in the dyeing industry for application to silk, wool and cotton.* Piédallu†, in fact, shows that the dye extracted from the glumes could be used for glove leather in a variety of tints according to the solutions of metallic salts used as mordants.

Amongst the Hausas " karan dafi " as a dye appears to be applied almost solely to leather and sometimes to fibres used in weaving mats. Throughout West Africa other articles are dyed with the same material, such as cloth fabrics and ornamental gourds, and in some places it is used as a body paint (*K.B.* 1891, p. 219.) Apart from leather the materials most extensively subjected to this dye are the strips of palm leaf or bast, and the grasses used for the finer varieties of mats, a usage which, like the application to leather, is found over a very wide area to North Africa and across to the Eastern Sudan. In the Western Sudan Chevalier‡ states that it is also used to dye the wool of the Macina sheep for the embroidery in red-brown and amaranth shades which decorates the cloths and rugs of Djenne and Timbuktu.

Barwood and Camwood (which are merely trade names for certain species of *Baphia* and more often of *Pterocarpus*), have been stated to be used in Nigeria as red leather dyes, and it is possible that they may be so applied, but there appears to be no definite record of such use. The usual native applications of these redwoods, at one time used in Europe in admixture with other dyes and with mordants chiefly for wool, are as a body paint and sometimes for cotton fabrics.

The flowers and red-veined leaves of *Gossypium arboreum* L. var. *sanguineum* Watt (a variety of the cotton plant known in Hausa as " kanawa "), yield dyes. That of the flowers is referred to under black leather dyes. The Hausas use the crushed leaves along with lime juice as a red dye for cotton thread, and are said to use it in general like " karan dafi," but I have not found any definite record of its application to leather.

The use of imported aniline dyes for Hausa leather is common, and magenta crystals have long been familiar in native markets for use

* Sichard, " Monographie de la Canne à sucre de la Chine, dite Sorgho à sucre," Chap. 18 and 19, 2nd Ed., Paris, 1858; and Piédallu, " Le Sorgho, son histoire, ses applications," Paris, 1923.

† l.c. p. 340.

‡ Revue de Botanique Appliquée, 1924: 540.

in dyeing other articles as well as goat skins. A solution of the dye is simply painted on the tanned hide.

In Morocco goat-leather is at present dyed red largely by imported European dyes, but the older methods using native madder (*Rubia peregrina*), with alum as a mordant, and by cochineal imported from the Canary Islands, are also still employed.

At the same time the use of tinctorial Sorghums is perhaps not unknown. In Algeria, certainly, *Sorghum* is used for dyeing both leather and wool. Also the Bulrush Millet (*Pennisetum typhoideum* Rich.), includes several varieties in which the inflorescence, but not the leaf-sheath, is coloured red or violet, and Trabut* mentions a purple-stained variety of this cereal—called in Algeria " tafsout hamra "—which is applied for the same purposes. The articles to be dyed, leather or wool, are passed through a solution of alum and then soaked in a warm decoction of the dyestuff " tafsout." In this instance the mordant precedes the dye. The use of alum, as a mordant with *Sorghum* dye for glove leather, is stated by Piédallu to give " vieux rose " tones, and, when alum is used as a preceding mordant on cotton, dove-colour with more or less violet tints is obtained.

Yellow Leather Dyes.

In considering the yellow-dyed leather of the Hausas the native word " gangamau " is in frequent use and requires a note of explanation. The word is applied to at least three kinds of yellow dye, and in some cases by inference to the plants which produce them. One of these is an Asclepiad quite recently ascertained to be *Cryptolepis sanguinolenta* Schltr., which appears to have no alternative name in Hausa. Another is turmeric, *Curcuma longa* Linn., but this has another native name, " zabibi," and the word " gangamau " as applied to it probably refers to the dye rather than to the plant itself. The following incident, however, is of interest. In 1906 an Indian bullock driver in N. Nigeria attached to the waggon transport, in trying to obtain the ingredients to make a curry powder found all but the usual colouring agent. On arrival at Kano he recognised in the market the required turmeric root sold under the name of " gangamau." The yellow dye produced from the leaves of *Anogeissus Schimperi* Hochst. is also sometimes referred to as " gangamau," but the plant itself has a quite different native name.

Hausa leather is usually dyed yellow by the use of one of the above. Occasional use may at times have been made of some other yellow dyes of vegetable origin, amongst which may be mentioned *Cochlospermum tinctorium*, *Sarcocephalus esculentus* and *Enantia polycarpa*. Lastly an imported artificial yellow dye is used in some localities. Comparatively fine skins are generally selected for yellow shades.

* Revue de Botanique Appliquée, 1924 : 540.

1. *Cryptolepis sanguinolenta* Schlechter (*C. triangularis* N.E. Br., *Asclepiadaceae*), is a woody twiner and climber with a distribution from Gambia to Angola. The fresh sap (of specimens raised from seed at Kew, 1925), is orange-red and resinous, and the stem and root show a bright-yellow section. Mature follicles, which do not appear to have been described previously, have been received recently, collected by Dr. Moiser in Sokoto Province, Northern Nigeria. They are linear-terete, glabrous, striate, 5–8 inches long with a hooked beak.* The fractured base of the follicle shows, in the samples received, a dried red resin. The root appears in native markets as cylindrical, sometimes slightly tortuous pieces, yellow when cut across, and more or less corrugated longitudinally.

This plant was originally described as *Pergularia sanguinolenta* Lindl., and was raised at Chiswick in the Royal Horticultural Society's gardens from seeds brought from Sierra Leone by G. Don in 1822. The only native name for it known at present is the Hausa "gangamau."

The following description of the dyeing process with this material is abstracted from notes taken by Dr. Moiser in the course of observations in Sokoto. The ingredients used are the roots of *Cryptolepis* and the fruit of tamarind, *Tamarindus indica* Linn. The roots are crushed and ground in a wooden mortar, and a little hot water added with stirring. This extract is of a dull-yellow colour and must be freshly made for immediate use. Tanned goatskins are used and the tanned surface is rubbed over with a cloth dipped in a little groundnut oil. The hide is then folded in two, the tanned surface outwards, and dipped in the pot containing the dye-bath, the extract being well rubbed into the surface with the hands. After a few minutes a piece of tamarind paste is added and the mixture again rubbed in. The tamarind paste is prepared from the entire pods, complete with seeds and pulp, soaked in cold water and then gradually warmed in a vessel over the fire to a temperature that can well be borne by the hand. The soft pulpy mass is then wrapped in leaves and kept for use.

The skin is removed from the pot by a sort of circular motion through the fingers, which has the effect of removing most of the mixture, and is then opened out and shaken and exposed to the air for 2 or 3 minutes, any adhering moisture being wiped off. This exposure to the air is regarded as an important item in the process. The skin is then returned to the vessel and the mixture again rubbed in for about 5 minutes, after which it is wiped clean and hung up to dry.

The effect of the tamarind pulp in the above process is probably to purify the colour, and it removes the red tint, which would be developed if any alkali had been used in preparing the dye-bath.

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* In the Catalogue of Welwitsch's African Plants, vol. 1, 3 : 677, under *Cryptolepis triangularis* N.E. Br. occurs the note, "There is in the study set a unique follicle, probably young, which is narrow, hooked at the tip, 1 in. long and sparingly lepidote-puberulous."

2. *Curcuma longa* Linn. This, the turmeric of the East, is fairly well known in West Africa and is cultivated along with ginger in the forest regions. In the open country north of the forests it is common enough in native compounds and seems to be cultivated almost solely for use as a dye. It was probably introduced to Nigeria by Arabs via Lake Chad, as the name in Bornu (Kanuri language), is " kurgum " (" kurkum " being one of its names in Arabic). In Hausa it is known as " zabibi " and " gangamau."

Samples of the root, sent under the latter name at different times to the Imperial Institute (no. 30472 of 10/6/09 in Herb. Kew.), and to Kew (1921) have been determined as *Curcuma longa* Linn. A sample of sliced root sent by Dr. Moiser under the name " zabibi " came from Zaria in N. Nigeria and was similarly identified. It corroborates the name " zabibi " for *Curcuma* accompanying a flowering specimen from Abinsi on the Benue River in 1912 (Herb. Kew. *Dalziel* 828, and in Hausa Botan. Vocab. p. 105).

The method of use in its simplest form is merely to make a paste of the pulverised turmeric root with water, and rub it well into the tanned hide after lightly oiling the surface. The skin is then washed with a weak mixture of lime juice and water and dried in the sun.

In Bornu it is said that the hides to be dyed yellow are not oiled, and that the dyestuff is prepared for use by mixing with water and the native mineral " kanwa," which, as stated above, is a mixture of sodium carbonate and sodium bicarbonate. This alkali necessarily turns it almost red, but the colour is purified to yellow by the usual wash of lime juice and water. In Sokoto *Curcuma* is used as a dye for cloth, by a process identical with that above described as applied to leather treated with *Cryptolepis*, along with tamarind pulp and hot water.

Turmeric is recognised in the dyeing industry as one of the " Direct Colours " (*i.e.*, capable of dyeing cotton without a mordant). Applied to cotton, wool or silk it is used in a weak solution of acetic acid or alum. It is probable that the *Cryptolepis* dye may be found to be of the same nature as turmeric.

3. *Anogeissus Schimperi* Hochst., and *A. leiocarpus* Guill. & Perr. (*Combretaceae*). Two species have been confused under the name *A. leiocarpus* Guill. & Perr., and the majority of specimens in the Kew Herbarium belong to *A. Schimperi* Hochst., which ranges from the Senegal coast to the eastern Sudan and Upper Nile region. *A. leiocarpus* proper seems to be limited to the far western part of the Sudan from Mauritania to French Guinea. Under this distribution the Hausa name " marike " refers to *A. Schimperi*, but it is probable that the economic properties are common to both species.

The tree " marike " is a very common one throughout the Sudan and its medicinal and other domestic uses are familiar to the natives all over that area. In Nigeria (Hausa and Bornu), the wood-ashes are used as a dehairing agent, for hides, and by the Yorubas as a mordant for *Lonchocarpus* indigo. The leaves, roots and bark all seem to contain tannin and are sometimes used in different localities

for tanning goat-skins.* A yellow dye is derived from the leaves. According to Chevalier the tree is actually planted near villages in Dahomey because of its tinctorial properties†, and also amongst the Bambaras in Senegal the leaves are employed for this purpose.

In dyeing leather the Hausa method employed is to wash the tanned skin in a cold infusion of *Anogeissus* leaves as the dye, to which has been added a solution made from a native earth or clay which doubtless acts as a mordant. The process as noted by Dr. Moiser is as follows :—(*a*) dried leaves of " marike " are pounded in a wooden mortar, water is poured on and allowed to stand overnight. (*b*) " ashauma," a sort of clay obtained from the hills at Wurno (some 20 miles N.E. of Sokoto), is mixed with water and made into flat cakes and sun-dried. Some " ashauma " is placed in a bowl and a little water added and allowed to stand for a couple of hours ; the clear fluid is then decanted for use.

The " marike " leaves are removed from the dye-solution, which is now divided into two parts in two bowls. A little of the " ashauma" water is added to one and the skin is steeped in this and stirred with the hands for about one minute. It is then removed, shaken, and placed in the second bowl to which a little " ashauma " water has been just previously added. The skin is stirred in this for a minute, then removed, wrung through the hands, and hung up to dry. The dye-solution cannot be used twice.

A goat-skin, dyed yellow by the above method, is on exhibition in Museum No. 1, at Kew. The " ashauma " or " ashoma " is sold in native markets at about a penny per cake and is used medicinally as well as in dyeing. When broken up it appears as granular friable pieces of a whitish or dirty greyish-brown colour according to its purity or admixture with soil. Its soluble constituents have been found to consist chiefly of aluminium sulphate along with sulphates of magnesium and calcium.‡

The presence of aluminium sulphate (forming 5·2 per cent. of the crude earth), accounts for its use as a mordant in the native method described. This application is of course, in the circumstances, purely empirical, and represents what in primitive races must have been the first advance, from the simple use as dyes of fruit juices and vegetable infusions, to the discovery that a permanent stain could be attained by mixing them with native earths containing iron or alumina.

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* In India a liquid extract of the leaves of *Anogeissus latifolius* Wall. is used for tanning, and a black dye can also be obtained from the leaves.

† Chevalier—Bull. Soc. Acclim. 1912 : 105.

‡ Through the courtesy of Dr. T. A. Henry I am indebted to Mr. J. A. Goodson, F.I.C., of the Wellcome Research Laboratories, for the analysis of a small sample of " ashoma " as follows :—" The material soluble in water was examined and found to have the following percentage composition :—

Aluminium sulphate $Al_2(SO_4)_3$	59·6
Calcium sulphate $CaSO_4$	7·7
Magnesium sulphate $MgSO_4$	11·2
Water not lost at 100° C., organic matter and undetermined	21·5

The material is free from chlorides and nitrates." J. M. D.

Some other plants which yield yellow dyes have been stated to be used sometimes for leather as well as for other materials. They deserve no more than passing notice.

4. *Cochlospermum tinctorium* A. Rich. A yellow dyestuff is obtained from the roots by boiling and is used, perhaps all over the savannah regions of West Africa where the plant grows, for dyeing cotton (*K.B.* 1921, p. 245). The Hausas apparently do not use it for dyeing leather, or only rarely, but Pobéguin*, while making no reference to cotton, mentions it as a leather dye in French Guinea. This species is referred to again under green leather dyes.

5. *Sarcocephalus esculentus* Afz., a West African forest tree, has a yellow wood of little value as a dye. The shrubby form of this in the more open country is known as var. *Russegeri* Havil., and is called in Yoruba "agbesi." The yellow root yields a dark-yellow dye which has been used for the coarser grades of native leather but is of comparatively little importance.

6. *Enantia polycarpa* Engl. & Diels, is an Anonaceous "Yellow Wood" which grows in Sierra Leone. Afzelius' specimen in the British Museum Herbarium bears the legend "a yellow dye wood containing berberine." The bark, which has been known under the name of "Abeokuta Bark", also yields berberine and in West Africa "an extract is used for dyeing skins and mats." This statement is referred by Holland† to The Technologist, 1865, 562, where mention is also made of the fact that the bark and root of the common barberry (*Berberis vulgaris*) yield the same alkaloid and are used in parts of Europe for leather dye as well as for woven fabrics, &c.

7. Imported dyestuff. Various aniline dyes are commonly sold in native markets. An artificial yellow dye has been in use for leather for a considerable number of years in the upper Benue region, Yola and the adjoining parts of North Cameroons, but, although the practice has probably extended to other areas, it is apparently not or only rarely applied for this purpose by the Hausas proper. The method is simple, the powder being mixed with water and rubbed or painted on the tanned skin, which is not oiled before the application. In Morocco, where aniline dyes are now used for most colours, the yellow dye for goat-skin leather is still obtained from pomegranate rind, gathered unripe and sun-dried, along with alum.

Green Leather.

The green tints on Hausa leather are obtained in three ways :—

1. Copper or brass filings with a mineral salt. In this method three peculiar features are to be noted. Firstly, sheep-skins are used, apparently because they are lighter and thinner than goat-skins; doubtless also because they are more porous in texture than goat-skins, which are altogether tougher and finer in grain. It may be

* Pobéguin, Flor. Guinée Franç. 163.

† Holland, The Useful Plants of Nigeria, Kew Bull. Add. Ser. 9, 1 : 51.

mentioned that the pelt of the Nigerian sheep is hairy not woolly. Secondly, the application is made on the fleshy side and not on the outer surface of the hide.* Thirdly, the hide is not tanned.

The general principle of application is as follows :—The skin is first subjected to the usual processes which precede tanning by the native methods, *i.e.* unhairing by soaking in a solution of wood-ashes (preferably of *Anogeissus Schimperi*), followed by a bating bath composed of a decoction of the plant "serri" (*Daemia cordata* R. Br., *Asclepiadaceae*). After scraping, pulling and stretching to render it soft, pliant and absorbent, the skin, instead of being tanned in the usual course, is ready for the green dye, of which the chief ingredients are brass or copper filings and a white mineral salt called in Hausa "sunaderi." The latter is now known to be almost pure ammonium chloride, and is used in Northern Nigeria in native methods of brazing and welding metals. Common salt is sometimes an additional ingredient, and to these substances, mixed in an earthenware pot or large calabash, is added either a cold infusion of tamarind pods or some fresh lime juice generally mixed with sour milk. Some of a previously made preparation having been added to the fresh ingredients, the mixture is stirred with a swizzle stick, not with the hands, and becomes bright-yellow rapidly turning to green. The resulting dyestuff can be kept for use in the form of a paste.† The skin is stretched tightly, flesh side upwards, on pegs at a height of a few inches from the ground. The paste is poured on the centre of the exposed surface of the skin and distributed in a thick layer by means of a shell. If any rubbing takes place the operator is careful to cleanse the hands immediately, as the paste causes a deep-black staining of the nails which is difficult to remove. The stain penetrates to the outer or hair surface of the skin, after which the dyestuff is removed, the skin is wiped with a little water and hung up or laid out to dry.

According to Dr. Moiser, who observed it in Sokoto, this process is known in Hausa as "almoaza"; the procedure differs from the alternative method described below in being carried out in the open air and not in a hut; instead of rubbing the dye-paste in by hand a thick mat is arranged to cover the skin stretched on pegs, and after about three hours when the staining is complete the paste is removed and the skin is wiped and hung up to dry.

The alternative method is held in higher esteem by the Hausas and is called "dawul." In this process tamarind pulp is not used and the proceedings take place under cover, generally inside a hut. The ingredients used are :—brass or copper filings : "sunaderi" (ammonium chloride) : a native mineral salt called "balma" : sour

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* In European practice buckskin, chamois and Suède used for glove leather are dyed from the flesh side (Piédallu l.c. 431).

† The use of old dye-liquors to ensure an even colour free from streaks and patches on animal fibres is familiar in the case of those dyestuffs which are applied in an acid solution to wool and silk and also to leather ("acid colours").

milk : some of the residual green powder kept from previous use and called " zamzari."

The salt, " balma " or " bilma ", is a commercial commodity brought from Bilma in the French Sahara north of Lake Chad ; it consists chiefly of sodium chloride and sulphate with smaller amounts of potassium chloride and sodium carbonate. Dr. Moiser's account is here mainly followed :—The ingredients are measured, $5\frac{1}{2}$ parts of " zamzari " are placed in a bowl with 1 part each of filings," sunaderi " and " balma " ; to the mixture is added sour milk and the whole is stirred to the consistency of thick cream. The untanned skin, scraped clean of excess of moisture, etc., is stretched very carefully until quite taut on a wooden frame about $2\frac{1}{2}$ feet square, which is laid horizontally and supported at each corner on a small stone. The flesh side being upwards the mixture is poured on at the centre, spread evenly over the surface by means of a shell and rubbed in fairly vigorously for a few minutes. A little sour milk is then added and the rubbing continued for a quarter of an hour, by which time the stain has begun to appear on the outer surface. The middle line of the back where the skin is thicker appears as a pale line. The finger is pressed along this streak and a little of the " sunaderi " and " balma " are sprinkled on it. A little water is added from time to time, a shellful at a time, and gentle rubbing with the back of the shell is continued, until the pale streak is obliterated and coloured like the rest of the skin. The frame is then lifted and shaken horizontally, to distribute the fluid evenly over the surface, and then replaced, the whole process having taken about an hour.

The finishing touch is curious and from the native point of view important. A small piece of iron is placed at the centre of the skin and pressed into it to remain until the dye-mixture is scraped off next morning. A closely woven grass mat, fixed on canes, serves to cover the skin on its frame, which is allowed to remain overnight and is then placed outside for 3 or 4 hours to dry. The dyestuff, now a dry powder, is scraped off with the edge of the shell, the skin is detached from the frame and its edges trimmed. A small brown spot is seen at the centre of the skin where the iron was placed, and this is a " trade mark " peculiar to the " dawul " process, which is regarded as a more lasting method. In Hausa law it is an offence to put a similar mark on a skin dyed by the " almoaza " method.

The dry blue-green powder, which is scraped off the skin at the end of the dyeing process, is called " zamzari." It is washed with several changes of clean water in a small vessel and then dried and kept for future use as one of the ingredients of the dye. The water used in these washings is carefully collected and allowed to deposit a greenish sediment, which is dried and sold in markets in the form of small green-pea-like pellets. This, known in Hausa as " korino ", —a name used also for the green leather itself—is a reputed medicine for eyes, ulcers and skin diseases.

2. Imported aniline green is commonly sold in Hausa markets, and as its application (to the outer or hair side of the skin), is much

simpler than the native process it is frequently used. In Bornu it seems to have been for many years the only green dye for leather.

3. Compound shades of green are obtained by a mixture of vegetable dyes, namely, indigo and yellow dye. As regards the latter, both turmeric and the root of *Cochlospermum tinctorium* have been used, and the indigo so far as recorded observation goes has been *Lonchocarpus cyanescens*. Millson* refers (though not specifically to leather), to the combined use of " elu " (*i.e.*, *Lonchocarpus* indigo), with *Cochlospermum tinctorium* in " making the sacred green dye, which is a secret trade of certain Hausa families," but, although such an industry may be to some extent hereditary, there does not seem, at the present time at least, to be anything secretive in the method or materials (*K.B.* 1891, p. 219.) The methods with brass filings and synthetic aniline dye are those in most common use, but various tints from bluish to bright green may be seen in market leather, and with three native yellow dye plants (*Cryptolepis*, *Cochlospermum* and *Curcuma*), along with two forms of indigo (*Indigofera* and *Lonchocarpus*), it is probable that various combinations are made.† As a rule the lighter goatskins are used for the green and bluish shades.

Black Leather Dye.

In the native Hausa process the essential ingredients are iron, in the form of blacksmith's slag, with sugar or honey and a vegetable material containing tannin ; the resulting black dye is called "kuloko." Tanned hides are used and may be either coarse or fine.

The refuse slag iron from the blacksmith's charcoal furnace (known in Hausa as " kashin mukira " or " kwan mukira "), or the scum of molten iron (" kashin tamma "), probably consists mainly of fused oxide of iron and carbon. Small pieces of iron or tin or iron ore may be added. " Sant " pods (*Acacia arabica*), uncrushed and in unlimited quantity, are placed, along with the iron material, in a pot with water and left for about 3 days to ferment. The dark fluid is concentrated by boiling and before use either honey or loaf sugar is added.

In Sokoto, according to Dr. Moiser's observation, the ingredients used were as follows :—blacksmith's iron refuse ; the ripe hard fruit of the " goreba " palm (*Hyphaene Thebaica*) ; limes, ripe or unripe ; bones ; tin or iron in small pieces ; water in which Guinea-corn has been boiled. These are all mixed in a pot and allowed to remain for 3 days.

The skin is dyed over the whole surface or in stencilled patterns, the dye being applied by a piece of leather or a wisp of straw.

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* Kew Bull. 1891 : 219.

† In India compound green shades are obtained from turmeric with indigo (*Indigofera*), fabrics being dyed first in indigo and then dipped in a solution of turmeric ; also to a mixture of turmeric with pomegranate rind and alum is added indigo, giving a greenish yellow colour (Watt. Dict. Econ. Prod. India, 2 : 666–7).

In North Dahomey a black stain for leather is obtained from the wine-red flowers of a variety of the cotton plant (*Gossypium arboreum* L. var. *sanguineum* Watt), which is cultivated in villages for that purpose.*

A fine black stain for leather is obtained in West Africa generally from an imported artificial dye, and a simple crude black colouring by the use of Indian ink is also common.

Blue Leather Dye.

Blue dyes in Nigeria are obtained almost entirely from plants which yield indigo, namely, *Lonchocarpus cyanescens* Benth. (*K.B.* 1921, p. 242; Add. Ser. ix, p. 244) and several species of *Indigofera* (*K.B.* 1888, p. 74 and p. 268; 1890, p. 242; Add. Ser. ix, p. 190). The subject is too extensive to be included here and will be dealt with in a later paper.

XXXI.—DECADES KEWENSES Plantarum Novarum in Herbario Horti Regii Conservatorum. DECAS CXIV.

With the completion of the Flora Capensis and the Flora of Tropical Africa as far as the grasses, the need for the series of **Diagnoses Africanae** no longer exists (*K.B.* 1894, p. 18). New species of African grasses and economic and botanical notes bearing on them will appear in a series entitled **Notes on African Grasses,** whilst new species and notes connected with the African Regional Floras will appear under separate series bearing the name of the flora to which they relate. Occasional new African species other than the above will in future be published under the **Decades Kewenses.**

1131. **Hugonia trigyna** *Summerhayes* [Linaceae]; ab omnibus speciebus stylis constanter 3 valde distincta.

Frutex alte scandens; ramuli teretes, striati, juventute pilosi, maturi glabri, pallide brunnei, lenticellis albidis sparse induti. *Unci* sub inflorescentia geminati, pubescentes, circinati. *Folia* ad apicem ramulorum plus minusve conferta, alterna, 3–5 mm. petiolata, petiolo gracili sparse brunneo-pubescenti; laminae oblanceolatae, apice acutae et minute apiculatae, basi cuneatae, 3·5–5·5 cm. longae et 0·9–1·6 cm. latae, remote et minute denticulatae, chartaceae, utrinque costa pilosa excepta glabrae; costa utrinque prominens, nervis lateralibus circiter 9 arcuatis anastomosantibus, nervis tertiariis numerosis reticulatis utrinque prominentibus; stipulae profunde 4-partitae, laciniis linearibus vel anguste lanceolatis, appresse hirsutae, usque ad 5 mm. longae. *Flores* in axillis foliorum solitarii, 1–1·5 cm. pedicellati; pedicelli graciles, medio articulati, glabri, inferne bracteolati, bracteolis 4–5-fidis stipulis subsimilibus; sepala basi connata, ovata vel

* Réteaud in Revue de Botanique Appliquée, 1924: 211.

elliptico-ovata, 3·5–5 mm. longa, ciliata, extra glabra, intus breviter sericeo-pilosa; petala oblongo-spatulata basi in unguem angustum exeuntia, flavida, sepalis 4-plo longiora; stamina 10 in tubum sepala fere aequantem connata, 5 dimidium petalorum superantia, 5 breviora, antheris 0·75 mm. longis; ovarium ovoideum, glabrum, stylis 3 supra medium separatis stigmatibus crassis coronatis. *Fructus* non visus.

Tropical Africa. Portuguese East Africa: climber on trees, Nov., *C. E. F. Allen* 76.
Vernacular Name: Untalabula (Makua).

1132. **Ochna confusa** *Burtt Davy & Greenway* (Ochnaceae); species affinis *O. leptocladae* Oliv., sed habitu robustior, cortice cinerascente pustulato epidermide membranacea decidua, sub anthesi jam foliata differt.

Frutex glaber, lignosus, circiter 1 m. altus; rami virgati, cortice cinerascente pustulato, epidermide membranacea, sub anthesi plus minusve foliati. *Folia* juniora breviter petiolata, 2–5 cm. longa, 0·8–1·2 cm. lata, lanceolata, subacuta, basi attenuata, serrata; folia matura breviter petiolata, plus minusve coriacea, supra atroviridia, infra pallidiora, 5–10 cm. longa, 1·2–2·7 cm. lata, oblanceolata, interdum lanceolato-elliptica, apice rotundata vel obtusa, in petiolum attenuata; costa utrinque prominens, nervis lateralibus distinctis. *Inflorescentia* in ramis abbreviatis umbellata, plerumque 3–4-flora; pedicelli graciles, 1·3–1·8 cm. longi, basi articulati. *Sepala* 7–8 mm. longa, 5 mm. lata (fructu 15 mm. × 5–9 mm.) pallide viridia, demum purpurea, ovata vel elliptica, apice rotundata. *Petala* 10 mm. longa, 5 mm. lata, apice rotundata, basi in unguem attenuata. *Filamenta* 4 mm. longa; antherae 2 mm. longae, oblongo-lineares, longitudinaliter dehiscentes. *Fructus* subglobosus, 8 mm. diametro.

South Africa. Transvaal: Lydenburg District; Pilgrims Rest, 1400 m., fl. Oct., *Rogers* 23068! Barberton District; Barberton, fl. Nov., *Rogers* 18264! (Types in Herb. Rogers.)

1133. **Swainsonia lessertiifolia** *DC.* in Ann. Sci. Nat. sér 1, iv. 99 (1825) [Leguminosae-Galegeae]; descriptio ampliata auctore V. S. Summerhayes.

Caulis (unicus exstans) erectus, herbaceus, longitudinaliter striatus, pilis appressis basifixis usque ad 0·8 mm. longis plus minusve dense indutus. *Folia* imparipinnata, usque ad 18·3 cm. longa; rhachis densiuscule appresse pilosa; petiolus circiter 1 cm. longus; foliola circiter 7-juga breviter petiolulata, elliptico-oblonga vel oblonga, apice obtusa vel rotundata, rarius subacuta, 8·5–15 mm. longa, 3·2–5·6 mm. lata, juventute dense cano-sericea, demum supra glabra subtus pilis appressis brevibus basifixis induta, costis supra prominentibus subtus impressis; petioluli 0·4–0·8 mm. longi. *Stipulae* late ovatae, 3·2–4·5 mm. longae, subscariosae, apice rotundatae, ciliatae, extra appresse pilosae. *Racemi* axillares, circiter 11–15-flori, usque ad 19·5 cm. longi, pedunculis

usque ad 14·5 cm. longis sparse vel densiuscule appresse pubescentibus; bracteae ovatae, acutae, 1·2–1·7 mm. longae; pedicelli 1–2 mm. longi, dense nigro-brunneo-pubescentes. *Flores* circiter 1 cm. longi. *Calyx* in toto 3·5–4·5 mm. longus, utrinque nigro-brunneo-pubescens, lobis 5 anguste deltoideis acutis 1–1·4 mm. longis. *Vexillum* et *alae* desunt. *Carina* oblique ovata, apice rotundata, 9 mm. longa, 4 mm. lata, inferne auriculata, ungue 3·2 mm. longo. *Filamenta* 6·5–6·8 mm. longa; antherae ovatae, 1–1·2 mm. longae. *Ovarium* lanceolatum, 5·5 mm. longum, subsericeum; stylus incurvatus, circiter 6 mm. longus, intus longitudinaliter barbatus; stigma minutum. *Legumen juvenile* oblongo-lanceolatum, 10–12 mm. longum, 3·1–4 mm. latum, acuminatum, dense brunneo-pubescens.

AUSTRALIA. "Nouvelle Holland, côte mérid. Mus: de Paris 1821" (Herb. Delessert).

1134. **Mucuna Lane-Poolei** *Summerhayes* (Leguminosae-Phaseoleae); affinis *M. Schlechteri* Harms, a qua caulibus appresse pilosis, foliis minoribus, inflorescentia brevissima et pedunculis pilosis differt.

Frutex scandens; caules volubiles, tenues, brunnei, leviter longitudinaliter sulcati, pilis longis retrorsis appressis sparse praediti. *Folia* trifoliolata; rhachis 3·9–5·7 cm. longa, supra canaliculata, appresse pilosa; foliola lateralia oblique lanceolato-ovata, 6·3–7·7 cm. longa, 1·9–2·5 cm. lata, longe acuminato-caudata, basi obtuse cuneata vel subrotundata, 3–5 mm. petiolulata; foliolum terminale anguste ellipticum, 7·4–8·7 cm. longum, 2·2–2·8 cm. latum, longe acuminato-caudatum, basi cuneatum, 4–6 mm. petiolulatum; foliola subchartacea, margine plana, leviter undulata, supra glabra, subtus praesertim ad nervos appresse pilosa; costa utrinque prominens; nervi laterales utrinsecus 3–5, arcuati, prope marginem conjuncti; petioluli supra canaliculati, dense longe appresse pilosi, subtus appresse pilosi, demum glabri; stipulae lineari-subulatae, 2–3 mm. longae, pilosae; stipella filiformia, 2–3 mm. longa. *Inflorescentiae* breves, pauciramosae, pedunculo 2·5 cm. longo; rami 4–5 mm. longi, biflori. *Flores* 2·5 cm. longi, 7 mm. longe pedicellati. *Calyx* 4-dentatus, utrinque dense et longe appresse pilosus; tubus 6 mm. longus; lobus superior late triangularis, 4 mm. longus, basi 9 mm. latus; lobi inferiores anguste lanceolati, acuti, 4–5 mm. longi. *Vexillum* ovato-ellipticum, breviter unguiculatum, apice parum emarginatum, supra unguem rotundato-auriculatum, 2 cm. longum, medio 1·4 cm. latum, intus inferne sparse appresseque pilosum. *Alae* anguste oblongae, superne versus apicem per 9 mm. oblique angustatae, uno latere unguiculatae, inferne longiuscule sericeo-ciliatae, lamina 2·2 cm. longa, unguibus 3 mm. longis. *Carinae* petala cultriformia, apice incurva, uno latere unguiculata, glabra, lamina 1·9 cm. longa, unguibus 6 mm. longis. *Stamina* 10, connata; filamenta linearia, circiter 2 cm. longa, 0·5–0·7 mm.

ata; thecae antherarum basifixae, oblongae, 5 longiores, 1·8–2 mm. ongae, leviter barbatae, 5 breviores 1 mm. longae, inferne longe barbatae. *Ovarium* anguste obovoideum, compressum, 6 mm. ongum, dense appresseque brunneo-hirsutum; stylus 1·9 cm. longus, nferne hirsutus, superne glaber, stigmate capitato coronatus. *Fructus* non visus. *Semina* nigra, 1·4–1·8 mm. longa, 1·1–1·5 mm. ata et 0·5–1 mm. crassa, laevia, minute punctata.

New Guinea. Owen Stanley Range, 1800 m., Feb. 23rd. *E. Stanley* in *Lane-Poole* 372.

1135. **Inga** (§**Leptanthae**) **Bollandii** *Sprague & Sandwith* [Leguminosae-Ingeae]; affinis *I. ciliatae* Presl, foliolis 1–2-jugis supra opacis, costa juventute excepta supra glabra nec setulosa, alabastris superne crassioribus, calycis dentium breviorum sinibus subtruncatis, corollis brevius sparsius indutis quam calycibus plusduplo longioribus differt.

Ramuli graciles, setulis fulvis patule ascendentibus hirsuti, densiuscule lenticellati, circiter 1·3 mm. diametro 10 cm. infra apices. *Folia* petiolata, 6–11 cm. longa, foliolis 1–2-jugis; stipulae subulatae, sparse setulosae, 4–9 mm. longae; petioli 3·5–10 mm. longi, triente inferiore incrassati subteretes, ceterum late alati, ala obovata elliptica vel suborbiculari; rhachis 1–2·2 cm. longa, late alata, ala obovata 0·7–1·4 cm. lata; foliola petiolulata, heteromorpha, ea paris superioris eis paris inferioris multo majora, juventute ciliata, costa supra sparse setulosa, demum glabra, supra opaca rete venularum inconspicuo, subtus nitidula manifeste reticulata; foliola inferiora ovata vel ovato-oblonga, 1·5–5 cm. longa, 1–2·5 cm. lata, breviter late obtuse cuspidata, acute apiculata, apiculo 0·5–1·2 mm. longo; foliola superiora subrhomboideo-lanceolata, pariter cuspidata et apiculata, apiculo 1–3 mm. longo, 4·5–8·5 cm. longa, 2–3·5 cm. lata, nervis utrinque circiter 10–13; glandulae interfoliolares breviter crasse stipitatae vel sessiles, circiter 1 mm. diametro. *Spicae* longiuscule pedunculatae, usque 20-florae; pedunculi sparse setulosi; rhachis 1·5 cm. longa, setulosa; bracteae arcuato-subulatae, circiter 5 mm. longae, sparse setulosae. *Alabastra* late clavata, breviter cuspidata. *Flores* vix pedicellati, circiter 3 cm. longi, pedicello (basi solida) circiter 0·5 mm. longo. *Calyx* campanulato-tubulosus, 5·5–6 mm. longus basi solida inclusa, extra subappresse setulosus; dentes subulati, 0·7–1·3 mm. longi sinibus subtruncatis. *Corolla* circiter 1·3 cm. longa, extra appresse fulvo-setulosa; lobi lanceolati, 2·5–3 mm. longi. *Tubus staminalis* circiter 1·1 cm. longus; filamentorum partes liberae 1·7–1·8 cm. longae. *Ovarium* breviter stipitatum, circiter 1·7 mm. longum; stylus circiter 2·8 cm. longus; ovula 12. *Legumen* ignotum.

Brazil. Ceará: Guarmaranga, about 50 miles inland, 900 m., *Bolland*.

Apart from the differences mentioned in the diagnostic phrase *I. Bollandii* approaches *I. ciliata* Presl closely in its technical characters, but the leaves are very different in general appearance,

the upper of the two pairs of leaflets being markedly larger than the lower. In *I. ciliata* there are usually 4–5 pairs of leaflets, gradually diminishing in size towards the base of the leaf.

1136. **Polyscias kikuyuensis** *Summerhayes* [Araliaceae]; ab affinibus *P. farinosa* (Del.) Harms et *P. Albersiana* Harms, pagina inferiore foliolorum maturorum, petiolulis, ramulis inflorescentiae, pedicellis fructibusque plus minusve dense fulvo-stellato-tomentosis satis distinguenda.

Arbor 15–18 m. alta; ramuli novelli fulvo-stellato-tomentosi, maturi glabri, cortice striato brunneo obtecti, cicatricibus foliorum delapsorum notati. *Folia* pinnata, magna, usque ad 28 cm. longa vel ultra; rhachis juventute fulvo-tomentosa, demum glabra, striata; foliola 3–4-(vel pluri) juga, 2–9 mm. petiolulata, ovata vel lanceolato-ovata, basi rotundata vel cordata, apice acuta, usque ad 18 cm. longa et 10·5 cm. lata, margine integerrima, supra glabra costa excepta, nitentia, subtus pilis flavidis vel fulvis stellatis dense induta; costa utrinque prominens, nervis lateralibus 12–16 patentibus versus marginem arcuatis supra impressis subtus prominentibus, nervis tertiariis numerosissimis reticulatis. *Inflorescentia* ramosa; ramuli primarii 15–32 cm. longi, fulvo-tomentosi, demum interdum glabrescentes; ramuli secundarii numerosi, 2–15 mm. in fructu usque ad 23 mm. longi, fulvo-tomentosi demum glabrescentes. *Flores* in umbellulis 5–14-floris apicibus ramulorum secundariorum dispositi, sessiles vel breviter pedicellati, ubique fulvo-tomentosi; calyx minutus, 4-dentatus; petala 4, ovato deltoidea, extra fulvo-tomentosa, intus glabra; stamina 4, antheris ellipticis, filamentis brevibus; ovarium 2-loculare, stylis 2 inferne connatis. *Fructus* ellipsoideus, compressus, leviter longitudinaliter costatus, fulvo-tomentosus vel glabrescens, 2–3 mm. pedicellatus, circiter 7 mm. longus, stigmatibus subreflexis coronatus.

Tropical Africa. Kenya Colony: Kikuyu Escarpment and Elburgon Forests, 2100–2400 m., timber tree up to 15–18 m. high, *A. M. Cooper in Herb. Battiscombe* 873 (type); Solai Forest, 2100 m., a tall timber tree with a diameter up to 1·2 m. Wood soft, white, inodorous, used for butter boxes. Common in wet forests all over the Colony above an altitude of 1800 m. An important economic tree. *H. M. Gardner in Herb. Battiscombe* 1294. Vernacular Name: Mutati (Kik).

1137. **Leucopogon** (§ **Perojoa**) **Rodwayi** *Summerhayes* [Epacridaceae-Styphelieae]; affinis *L. collino* R. Br., a quo floribus minoribus, forma bracteolarum et sepalorum, antheris brevioribus latioribusque et ovario majore differt.

Frutex circiter 45 cm. altus. *Rami* irregulariter ramosi, ramulis saepius versus apices ramorum confertis, pubescentes demum glabrescentes, cortice cinereo vel brunnescenti leviter ruguloso obtecti. *Folia* sessilia, lanceolata vel oblongo-lanceolata, apice acuta vix pungentia, basi angustata, 5–10 mm. longa, 1–2 mm. lata,

oriacea, plana vel margine leviter recurvata, minute denticulato-iliata, utrinque glabra, costa supra impressa, nervis subtus nediocriter conspicuis. *Inflorescentiae* terminales vel in axillis oliorum superiorum dispositae, nutantes, pluriflorae, terminalibus sque ad 2 cm. longis, lateralibus brevioribus usque ad 8 mm. ongis; rhachis pubescens; bracteae ovatae vel elliptico-ovatae, pice rotundatae, circiter 1 mm. longae, concavae, glabrae, subtus alde 7–nerviae. *Alabastra* ellipsoidea, 2–2·3 mm. longa. *Bracteolae* deltoideo-ovatae, basi late rotundatae, apice subacutae, irciter 1 mm. longae, superne ciliolatae, utrinque glabrae. *Sepala* , oblongo-elliptica, apice rotundata, circiter 1·5 mm. longa, uperne ciliolata, marginibus non-hyalinis, plurinervia. *Corolla* ate campanulata; tubus 0·7–0·8 mm. longus; lobi ovati vel anceolato-ovati, apice subacuti, circiter 1 mm. longi, extra glabri, ntus dense barbati. *Stamina* fauce corollae inserta, filamentis revibus; antherae oblongae, superne parum angustatae, 0·5 mm. ongae, 0·25 mm. latae, infra apicem sterilem brevem affixae. *Discus hypogynus* 5–lobatus. *Ovarium* ovoideum, 0·6 mm. longum, labrum, biloculare, stylo 0·3 mm. longo coronatum; ovula pro oculo solitaria, ab apice pendula. *Fructus juvenilis* cylindricus, reviter stipitatus, longe rostratus, maturus non visus.

NEW SOUTH WALES. Jervis Bay, on barren sandstone country verlooking the Naval College and on Bowen Island, Sept. 1925, *F. A. Rodway*.

The accompanying figure shows the floral differences between the new species and *L. collinus*, the vegetative parts being almost identical.

Fig. 1. *Leucopogon Rodwayi* Summerhayes. Fig. 2. *Leucopogon collinus* R.Br. (drawn from Brown's specimen collected at Port Dalrymple). a. corolla. b. bracteole. c. sepal. d. ovary.

1138. **Anthocleista keniensis** *Summerhayes* [Loganiaceae]; affinis *A. pulcherrimae* Gilg, a qua differt nervis lateralibus patentioribus et corollae tubo angustiore lobis fere duplo longiore.

Arbor 21–24 m. alta. *Folia* sessilia, elliptico-obovata vel obovata, 34–78 cm. longa, 13–28 cm. lata, apice rotundata, basi cuneata, coriacea, margine leviter undulata vel crenulata, revoluta, utrinque glabra; costa basi dilatata, utrinque valde prominens, nervis lateralibus utrinsecus 12–15 a costa fere angulo recto patentibus utrinque prominentibus ad marginem arcuatim conjunctis, nervis tertiariis numerosis prominente reticulatis. *Flores* in cymis magnis (25 cm. longis) multifloris thyrsoideis ex dichasiis compositis dispositi; bracteae deltoideae, acutae, 5–6 mm. longae, basi usque ad 1·6 cm. latae, coriaceo-induratae; pedicelli 0·5–1 cm. longi, crassi, articulati; sepala 4, ovata, aequilonga, coriacea, glabra; corolla calyce 3–4-plo longior, tubo angusto superne leviter et sensim ampliato circiter 3 cm. longo media parte 7·5 mm. diametro, segmentis ovato-lanceolatis acutis 1·6 cm. longis; stamina fauce corollae inserta; antherae sessiles, 7–9 mm. longae; ovarium ellipsoideo-ovoideum, 6 mm. longum; stylus gracilis, 2 cm. longus, stigmate capitato 3 mm. diametro coronatus. *Fructus* immaturus, ellipsoideo-ovoideus.

Tropical Africa. Kenya Colony: Sotik, 1800 m., tall timber tree, attaining a height of 21–24 m. Timber soft, leaves confined to ends of branches; not a forest tree, *Battiscombe* 1301 (type). East and South East Kenya, 1350–1500 m., tall tree, leaf-scars very prominent on old branches. *Battiscombe* 698.
Vernacular Name: Mutunguru (Kik).

1139. **Petunia Felipponei** *Sandwith* [Solanaceae-Salpiglossideae]; *P. humili* R. E. Fr. necnon *P. heterophyllae* Sendtn. affinis, ab illa foliorum fasciculis axillaribus, corollae lobis latis brevissimis, stigmate capitato; ab hac pedunculis pluries longioribus, calycis forma differt.

Suffrutex habitu non certe cognito sed verisimiliter prostrato, totus pilis brevissimis glanduliferis indutus, e radice perenni ramos numerosos ad 10–20 cm. longos emittens; internodia 0·3–1·8 cm. longa, versus summos caules sensim elongata. *Folia* alterna, sessilia, lineari-lanceolata vel lineari-oblonga, obtusa, 0·5–1·1 cm. longa, 1–2·5 mm. lata, omnia sed praesertim inferiora fasciculos axillares foliorum multo minorum sustinentia, plana, nervo inconspicuo sed basi tumido petioloideo, utrinque ut caules pedunculi calycesque pilis brevissimis glanduliferis obtecta. *Pedunculi* axillares, floriferi ascendentes, postea superne sursum arcuati, 2·5–3 cm. longi, itaque foliis pluries longiores. *Calyx* infra medium in lacinias subulatas acutas vel lineari-oblongas obtusas, aliquantum inaequales, 4–7 mm. longas, basi 1–1·5 mm. latas divisus; tubus obconicus 4 mm. longus, nervis 10 satis inconspicuis. *Corolla* pro hac sectione generis magna, late infundibularis, 2·2–2·6 cm. longa, tubo sparse glanduloso-piloso, ad 5 mm.

supra basin 2 mm. lato, tum maxime ampliato, limbo 2–2·5 cm. diametro in lobos brevissimos rotundatos diviso. *Stamina* 5 inclusa, 3 mm. supra basin corollae affixa, glabra, didynama, quinto duobus brevioribus paullo minore; stamina 2 longiora 6 mm., 2 breviora 3·5 mm. longa, quintum 3 mm. longum, parte adnata exclusa. *Ovarium* glabrum, ovoideum, 1·5 mm. longum, 1 mm. diametro; stylus glaber, 6 mm. longus, apice curvatus, stigmate discoideo-capitato; ovula numerosa, globoso-reniformia.

URUGUAY. Cerro Montevideo, *Herb. Dr. Florentino Felippone* 5065. The characters of this plant, showing affinity with both *P. humilis* R. E. Fr. and *P. heterophylla* Sondtn., are such as to suggest the possibility of hybridity; but *P. heterophylla* does not appear to have been recorded from Uruguay.

1140. **Polystachya (Caulescentes) microbambusa** *Kraenzl.* [Orchidaceae–Vandeae]; differt a *P. ensifolia* Lindl., floribus fuscis, petalis multo angustioribus, labello longius acuminato, ceterum habitu graciliore.

Radices copiosae longae albae. *Caules* stricti ad 40 cm. alti, basi plerumque defoliati vel cataphyllis marcescentibus vestiti, deinde foliati. *Folia* subdisticha, ad 10, ex vaginis basilaribus, sensim increscentia vel longissime lineari-lanceolata, 5-nervia, 8–15 cm. longa, 5–8 mm. lata, stricta, erecta, racemum pauciflorum excedentia, longe acuminata. *Racemus* speciminis unici mihi visi 6 mm. longus, vaginis 2 vel 3 (vel foliis magnitudine reductis) subcompressis acuminatis vestitus; rhachis brevisetosa, sicca sordide rubra; flores ad 5; bracteae anguste lineares ad 8 mm. longae, ovaria brevissime setosa aequantes. *Sepala* e basi paulo latiore triangula, longe acuminata, lateralia mentum nigro-setosum brevissimum triangulum obtusum formantia, 10 mm. longa; mentum vix 2 mm. longum, basi circiter 2 mm. latum. *Petala* linearia, 7–8 mm. longa, circiter 0·75 mm. lata, sepalis lateralibus arcte agglutinata. *Labellum* hastatum; lobi laterales trianguli, fere rectanguli; lobus intermedius longe productus, acuminatus, in disco pulverulentus, totum ad 8 mm. longum, inter lobos laterales basi circiter 3 mm. latum. *Gynostemium* latum. *Flores* (in sicco) intense sordide rubri fere nigri.

WEST TROPICAL AFRICA. Ivory Coast: Cercle de Baoulé-Nord, environs de Bouake, Mt. Lémélébon, fl. July, *F. Fleury* 22093.

Habitu Polystachyis Caulescentibus adscribenda et juxta *Polystachya ensifoliam* Lindl. et *P. imbricatam* Rolfe inserenda erit. Diagnosin scripsi ex alabastro maturo, floribus apertis ab insectis nimium injuriatis partes florum forsan paululo minores descripsi quam re vera sint. Tota planta aspectum praebet quam nomine specificio expressi.

XXXII.—NOTES ON AFRICAN GRASSES: I.

Digitaria Eylesii *C. E. Hubbard* sp. nov.; affinis *D. monodactylae* var. *explicatae* Stapf, sed spiculis glabris et culmis non caespitosis differt.

Gramen perenne, 60-65 cm. altum, e rhizomate longo repente ortum, internodiis nudis vel cataphyllis glabris vel cataphyllarum vestigiis indutis. *Culmi* erecti, graciles, glabri, simplices, 3-nodi, nodis glabris. *Folia* 4-5-nata, distantia; vaginae arctae, firmae, glabrae, laeves; ligulae truncatae, membranaceae, usque ad 0.75 mm. longae, glabrae; laminae lineares, superne longe tenuiterque attenuatae, 7.5-14 cm. longae, 2.5-3.5 mm. latae, planae, flexuosae, post ligulam pilis longis paucis exceptis glabrae. *Racemi* spiciformes, solitarii, terminales, graciles, 10-14 cm. longi, rhachi triquetra undulata 0.6 mm. lata, marginibus angustissimis viridibus tenuiter scabridis; pedicelli 2-3-nati, superne glabri vel hispiduli, inaequales, usque ad 1 mm. longi. *Spiculae* adpressae vel leviter patentes, lanceolato-ellipticae, acutae, 2.5-3 mm. longae, glabrae. *Gluma inferior* absens vel squamata minuta et hyalina; gluma superior late lanceolata, acuta, hyalina, 2 mm. longa, 3-nervia. *Anthoecium inferum* sterile; valva spiculae ambitu et magnitudine similis, subapiculata, 5-7-nervia, costa media quam lateralia prominentiore; valvula minuta. *Anthoecium superum* ♀; valva late lanceolata, acuta ad subapiculata, 2.5 mm. longa, tenuiter coriacea, atrobrunnea vel nigra, marginibus hyalinis; valvula similis sed minor. *Antherae* 1.5 mm. longae.

Tropical Africa. Rhodesia: Salisbury, on river bank, 1530 m., *Eyles* 3277.

This species is remarkable in having glabrous spikelets and in habit it is quite distinct from any other African *Digitaria*, its affinity being with *D. monodactyla* Stapf, in regard to the solitary raceme, and with the species of § *Setariopsis* as to its glabrous spikelets.

Digitaria Grantii *C. E. Hubbard* sp. nov.; affinis *D. Myuro* Stapf, sed laminis et culmis glabris, racemis plus minusve laxe vele contract paniculatis differt.

Gramen perenne, caespitosum, ad 50 cm. altum. *Culmi* erecti, simplices, teretes, superne (infra basin paniculae) pilosi, ceterum glabri, laeves, 1-2-nodi, nodis villosis. *Folia* plerumque basilaria; vaginae inferiores solutae, breves, basi dense pilosae, persistentes, demum fibrosae; superiores teretes, pilis e tuberculis minutis laxe indutae vel glabrae et laeves, in innovationibus imbricatae, purpurascentes, ore hirsutae; ligulae truncatae, ad 1 mm. longae, membranaceae, glabrae; laminae lineares vel lineari-lanceolatae, apice attenuatae, in innovationibus basi attenuatae, usque ad 10 cm. longae et 6 mm. latae, opaco-virides, purpureo suffusae, glaucae, glabrae, infra laeves, supra leviter scaberulae, marginibus scabris. *Panicula* usque ad 8 cm. longa; axis primarius 4-6 cm. longus, pilis albido-flavescentibus dense pilosus; racemi 8-15, plus minusve

compositi, erecti vel leviter patentes, solitarii vel 2-3-nati, inaequales, basin versus longiores et usque ad 4.5 cm. longi; rhachis primaria gracilis, triquetra, usque ad 0.5 mm. lata, longe pilosa, secondaria perbrevis, pedicellis ad 1.5 mm. longis vel brevioribus inaequalibus angularibus, pilis albido-flavescentibus spiculis aequilongis. *Spiculae* 1-4-natae, oblongae, obtusae ad subacutae, 1.8-2 mm. longae, glabrae; gluma inferior 0; gluma superior minuta, hyalina, truncata, integra vel lobulata, enervia, usque ad 0.5 mm. longa, albida vel purpureo suffusa, ad basin spiculae arcte appressa. *Anthoecium inferum* sterile; valva spiculam aequalis vel fere aequalis, ovato-oblonga, membranacea, albida, purpureo suffusa, 3-sub-5-nervia; valvula 0. *Anthoecium superum* ♀; valva late oblonga, obtusa ad subacuta, 1·9 mm. longa, pallide vel atrobrunnea, subcoriacea, marginibus hyalinis, tenuiter et arcte striata; valvula valvae similis sed angustior.

Tropical Africa. Tanganyika Territory: 2500 m., without precise locality, *D.K.S.Grant* 7 (in Herb. *Battiscombe* 1240).

"In small patches of 1 to 5 sq. yards, does not appear in cattle districts on the plains according to Masai" (*Grant*). A specimen from Kenya Colony (*J. McDonald* 928) is either a variety of this species or a closely allied new species; it has hairy and longer leaves and a much longer panicle (22 cm. long). The material available however is too scanty for description.

Digitaria mombasana *C. E. Hubbard* sp. nov.; affinis *D. erianthae* Steud., et *D. milanjianae* Stapf, sed foliorum vaginis dense villosis et spiculis minoribus differt.

Gramen perenne, ad 1.2 m. altum. *Culmi* erecti, e rhizomate breve orti, teretes, glabri, nitidi, simplices, 4-5-nodi, nodis glabris, internodio superiore longe exserto. *Foliorum vaginae* solutae, striatae, pilis longis albis patenti-reflexis molliter et dense villosae; ligulae truncato-crenulatae, scariosae, minute ciliatae; laminae lineares, superne longe tenuiter attenuatae, 16-45 cm. longae, 6-9 mm. latae, utrinque molliter tomentosae, marginibus cartilagineis et scaberulis. *Panicula* 10-13 cm. longa; axis primarius 3.5-5.5 cm. longus, scaberulus; racemi circiter 13, sessiles, 2-5-nati, 7-12 cm. longi, suberecti vel patentes, stricti vel flexuosi, pallide fusci; rhachis gracilis, triquetra, 0.75 mm. lata, marginibus angustis tenuiter scabridis; pedicelli 2-nati, inaequales, usque ad 1 mm. longi. *Spiculae* adpressae, imbricatae, lanceolato-ovatae, 2 mm. longae, ciliati-fimbriatae pilis longis acutis laevibus pallide luteis instructae. *Gluma inferior* minuta, ovata, obtusa, hyalina, enervia; gluma superior lanceolata, 1.5 mm. longa, 3-5-nervia, marginibus et apice pilosa, membranacea. *Anthoecium inferum* sterile; valva ovata, subobtusa, 2 mm. longa, 5-nervia, membranacea, marginibus et inter nervos marginales pilosa; valvula minuta. *Anthoecium superum* ♀; valva lanceolato-ovata acuta, 1.9 mm. longa, cinerea; valvula similis sed angustior.

Tropical Africa. Kenya Colony, coast and up to 60 m.

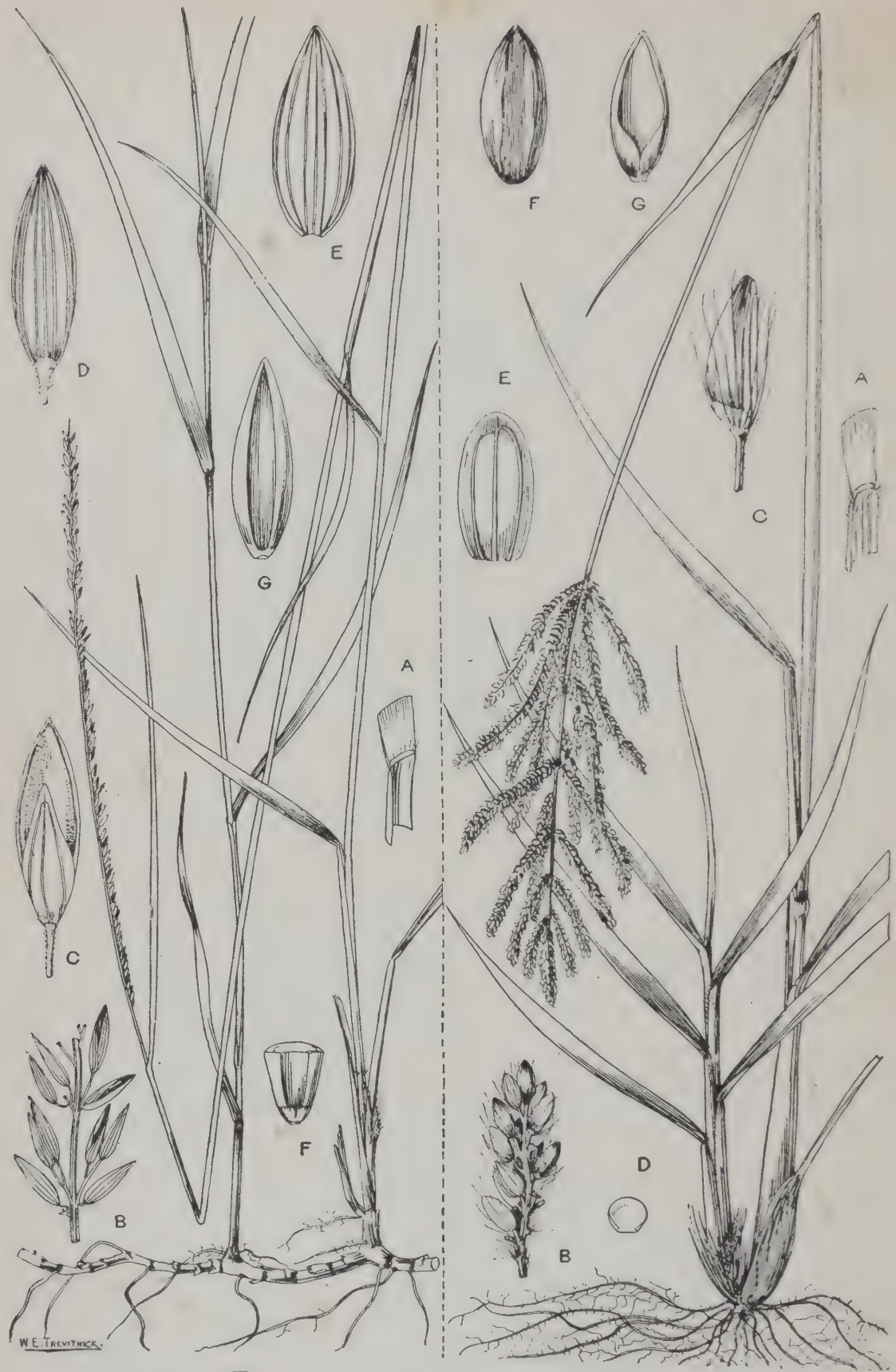

FIG. 1. FIG. 2.

Fig. 1. **Digitaria Eylesii** *C. E. Hubbard,* showing habit. A. ligule (nat. size). B. portion of raceme (x 6). C. D. spikelet (x 9). E. valve of lower floret (x 9). F. valvule of lower and part of upper floret (x 10). G. valve of upper floret (x 10).

Fig. 2. **Digitaria Grantii** *C. E. Hubbard,* showing habit. A. ligule (x $\frac{1}{2}$). B. portion of raceme (x 2). C. spikelet (x 10). D. upper glume (x 8). E. valve of lower floret (x 9). F. valve of upper floret (x 10). G. valvule (x 10).

FIG. 3.

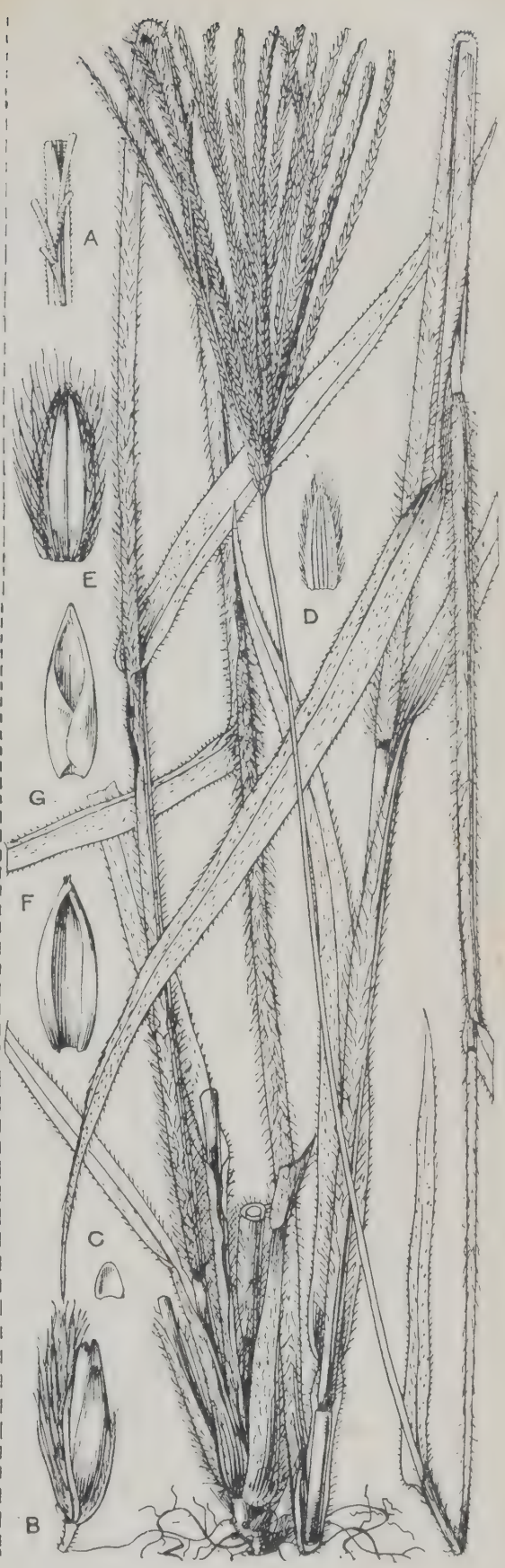

FIG. 4.

Fig. 3. **Panicum striatissimum** *C. E. Hubbard*, showing habit. A. spikelet (x 8). B. lower glume (x 8). C. upper glume (x 9). D. valve of lower floret (x 6). E. valvule (x 6). F. & G. valve of upper floret (x 6).

Fig. 4. **Digitaria mombasana** *C. E. Hubbard*, showing habit. A. portion of rhachis showing pedicels (x 4). B. spikelet (x 10). C. lower glume (x 25). D. upper glume (x 7). E. valve of lower floret (x 10). F. valve of upper floret (x 10). G. valvule of upper floret (x 10).

near Mombasa, on moist sandy soils, usually found in small patches of 1-3 sq. yds, *D. K. S. Grant* (in Herb. *Battiscombe* 881).

Vern. Name. "Ukusi."

Panicum striatissimum *C. E. Hubbard* sp. nov.; affinis *P. subflabellato* Stapf, et *P. neglecto* Roem. et Schult., sed gluma inferiori 7-nervis et quam spicula aequilonga differt.

Gramen perenne, debile. *Culmi* densi, e basi decumbente erecti vel patentes, 40-60 cm. longi, gracillimi et subfiliformes, teretes, glabri et laeves, multinodi, nodis glabris, ad nodos inferiores radicantes, multiramosi. *Foliorum vaginae* arcte striatae, laeves, glabrae vel margines pubescentes, 1.5-3.5 cm. longae. *Ligulae* ad seriem ciliarum minutarum reductae. *Laminae* erectae, rigidae, lineari-subulatae, involutae, striatae, 1.75-2.75 cm. longae, infra glabrae et laeves, supra leviter pubescentes. *Panicula* ambitu anguste ovata, ad 3 cm. longa, spiculis paucis; rhachis gracilis, teres, laevis; pedicelli gracillimi, flexuosi, 4-6 mm. longi. *Spiculae* ovato-oblongae, 3-3.75 mm. longae, acutae, pilis albis mollibus paucis obscuris pubescentes, nervis conspicuis. *Glumae* firme membranaceae, apice et margine hyalinae, inferiores ovato-lanceolatae, subobtusae, spiculis aquilongae, 6-7 nervae, superiores ovato-oblongae, 2.8-3.5 mm. longae, rotundato-truncatae, 6-7-nervae, cum nervis anastomosantibus. *Anthoecium inferum* ♂; valva late oblonga, 2.5-2.8 mm. longa, truncata, apice et margine hyalina, 5-subseptem-nervia, infra apicem cum nervis anastomosantibus; valvula angusta, truncata, 2.5-2.8 mm. longa. *Anthoecium superum* ♀; valva ovata, subacuta, 2.2-2.5 mm. longa, nitida, laevis. *Antherae* 1.3-1.6 mm. longae.

Tropical Africa. Kenya Colony: western slopes of Mount Kenya, along the trail from West Kenya Forest Station to summit, in the Bamboo zone, at about 3000 m. elevation; *Mearns* 1682 (type), 1750, 1760, 1766.

XXXIII.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. C. E. L. Anderson, Mr. D. P. Stanfield, Mr. D. B. Sabiston, B.Sc., Mr. J. F. B. Watling, Mr. A. H. Young, B.Sc., to be Produce Inspectors, Nigeria: Mr. P. J. Moss, B.Sc., to be Provincial Superintendent of Agriculture, Sierra Leone: Mr. R. E. Holttum, B.A., to act as Director, Botanic Gardens, Straits Settlements (*K.B.* 1922, p.223).

Miss Caroline Thackeray.—We learn with regret of the death, on the 30th January last at Mbweni, of Miss Caroline Thackeray. Since her retirement in 1902 from the mission work which had engaged her attention at Mbweni since her arrival there in 1877,

Miss Thackeray had lived in the Shamoa ja Balozi, at Mbweni, which was associated so intimately with the late Sir John Kirk (*K.B.* 1916, p. 1 ; 1922, p. 62). Its care had been one of her interests, and it is to be hoped that this historic plantation will continue to be maintained and kept intact in memory of that great African pioneer Sir John Kirk.

Dr. W. T. Brigham.—We regret to record the death on the 29th January last of William Tufts Brigham, Director of the Bernice Pauahi Bishop Museum, Honolulu. Although chiefly interested in ethnology, Dr. Brigham did much to further the economic interests of the island, and illustrated by exhibits in the Museum the history and produce of the Hawaiian islands. The present excellent state of the Museum is almost entirely due to the work of Dr. Brigham.

Eduard Hackel.—On February 17th Eduard Hackel, the agrostologist, died in his home at Attersee, Upper Austria, after a short illness. Although he had for a considerable time taken no active part in agrostological research, and although his leading publications were in fact crowded into the short space of less than a decade (1881–1889), so well-founded was his early work that it still appears almost as fresh and to command as much attention as when the results of his labours were made known.

The secret of his success was due in the main to his thoroughness and to his independence and freshness of thought coupled with a masterly exposition of the facts he had established and the ideas which in his eyes linked them into a whole. He was not especially anyone's pupil or follower. The course of his training kept him aloof from the ties of a powerful "school," which to a rising mind are as often a hindrance as they are a stimulus. He gave himself a good grounding in the theorising morphology which held the field when he took up the study of grasses and in the then modern technique of the systematist. As far as his special line of research is concerned the influence of Duval-Jouve's fine work was evidently a prominent factor. To this general equipment he added a keen eye for the detail and a persistent industry in following it up which must often have meant a considerable physical strain. He might well have lost himself in it but for method and a highly developed sense of synthesis. There could have been no severer test for this than the *Andropogoneae* which he monographed for De Candolle, a group of bewildering and apparently unconformable diversity. For the practical need of the man who has to name grasses he raised the art of description to a level hardly reached before him. So accurate and so full is the account he generally gives of a species that it is possible to prepare a drawing from it which when ultimately compared with an actual specimen will be found to tally with it to an astonishing degree.

Hackel's first publication *Untersuchungen über die Lodiculae der Gräser* (1881) was an attempt to interpret the morphological status of these peculiar and important organs of the grass flower. It contains some ingenious theorising, but hardly the final solution of the problem. It was followed by a *Monographia Festucearum Europaearum* (1882), a remarkably fine piece of delicate analysis and rather far-going and overgraded synthesis, particularly valuable, as it was largely tested by the study of living material.

We find him next engaged on work of a much more comprehensive scale, the elaboration of the *Gramineae* for Engler & Prantl's "Natürliche Pflanzenfamilien," which was brought to its conclusion in 1889, and of which a version in English appeared in 1896 under the title *The True Grasses*. This is the most universally known of his works and it still holds the field to a large extent. It is by no means his most original work and in fact it could not have been so. By the necessity of all the circumstances, the size of the family, the limited time available, the cyclopedic character of the publication it had to fit in and not least the conditions under which the work was carried on—the author was then teaching in a provincial town thirty-eight miles from the great herbaria and libraries of Vienna —Hackel was compelled to confine himself to a considered compilation from literature. The last volume of Bentham and Hooker's Genera Plantarum, containing the *Gramineae*, had just come out and it formed an admirable basis for a condensed practical synopsis. Prefaced with a lucid introduction into the general features of the family, and drawn up on a clear and workable plan, with a modicum of suitable illustrations—the synopsis caught on from the beginning and was soon generally accepted as the standard work on the genera of the grasses.

I have already referred to Hackel's magnum opus, his monograph of the *Andropogoneae* (1891), one of the masterpieces of descriptive botanical literature. This is not the place to enlarge on or to criticize it. It will for all time remain the foundation of our knowledge of this rich and puzzling group; but exploration, particularly that of the African floras, has since added such a wealth of forms that the perspective of our vision of the group is not any longer the same. New types have been added and old receptacles have been filled to bursting-point. Adjustment is unavoidable, but the solid framework of Hackel's monograph and the careful elaboration of the detail will endure. It is only natural that Hackel, once he had become an "authority" in his field, should be flooded with grasses for naming and eventual description from all parts of the world. For a long time he responded and numerous lists of identifications of grasses and of descriptions of new species from his pen are scattered through literature. His last contribution, a continuation of *Gramineae Novae* in Fedde's Repertorium, appeared in 1913.

Hackel was born on the 18th March, 1850, at Haida, in German Bohemia. After the usual preparation afforded by the Austrian

"Realschule" of those days (1859–1865) he went to Vienna, where, for the next three years, he attended a liberal course of lectures at the Polytechnic High School, obtaining finally the diploma for teaching natural history and chemistry in the "Realschule." This soon led to his appointment at the "Realschule" at St. Pölten, where he remained until his retirement in 1900. In 1876 he travelled largely in Spain and Portugal.

He was a man of fine physique and with prepossessing appearance and a warmth of character that were well-nigh irresistible. He had refined tastes and in his many years of leisure he and his wife travelled much in pursuit of their interests in the domains of art and science. When he selected Attersee, there to build for himself a tusculum, he was partly influenced by the charm of the scenery and the comparative mildness of the climate of the place, which he hoped would allow him, in a fair measure, to indulge in horticulture. In this he was not disappointed ; but in the end the evening of his life was blighted when the war and its consequences sadly reduced his resources and he found himself tied to a house and garden the upkeep of which was beyond his means.

O. S.

Abnormal Agave.—Most species of *Agave* bear the inflorescence at the apex of the short stem and die soon after the seeds have ripened, but not infrequently before doing so they produce lateral suckers from which new plants can be propagated. A plant of *Agave Ellemeetiana* C. Koch, now in the Succulent House at Kew, has recently produced several lateral inflorescences at the ground level below the lowest leaves. The largest of these spikes has reached a height of nearly a metre and borne numerous perfect flowers. A similar development in *Agave americana* L. is recorded in the Gardeners' Chronicle, 1884, xxii. p. 53, fig. 15, as occurring in the Botanic Gardens, Oxford, but in this case the inflorescence bore only two flowers and they were not perfectly developed.

C. H. W.

Nemophila.—In a paper published in the Kew Bulletin No. 1, 1926, dealing with certain species of this genus, we remarked that our work was limited because we had had no opportunity of field-work in California. We have recently received a letter from Miss Alice Eastwood, of the California Academy of Sciences, in which she states that the conclusions reached by us agree with her observations in the field. The following generalizations regarding habitat are given by Miss Eastwood: "*Nemophila atomaria* always grows in quite wet places, but not swamps. *Nemophila insignis* grows in sandy ground generally and never in wet places. *Nemophila liniflora* grows on hills adjacent to the ocean and is quite distinct from the other two. I collected it before the fire in 1906 at Bodega Head, where the type was collected. My specimens were destroyed

in the fire and I've not been able to go there since as it is a rather inaccessible place. I don't know *N. integrifolia* at all, but have always regarded it as one of the small flowered lot." It is extremely satisfactory to know that the results derived from genetical and herbarium studies are so far in agreement with independent conclusions reached by studying the living plants in their native habitats.

R. J. C. and W. B. T.

Calophyllum apetalum.—Willdenow in 1811 gave the name *Calophyllum apetalum* to *Tsjerou-ponna* Rheede, Hort. Mal. iv. 81, t. 39 (1683) and *Inophyllum flore quadrifido* Burm. Thes. Zeyl. 130, t. 60 (1737), which Linné (Sp. Pl. 514 : 1753) had erroneously included in *C. Calaba* L. In 1824 Choisy substituted the name *C. spurium* for *C. apetalum*, apparently on the ground that the latter was misleading. Wight and Arnott adopted *C. spurium* in 1834, but in 1840 Wight proposed the new name *C. decipiens*, because he had come to the conclusion that *spurium* was also misleading. He excluded Burmann's Ceylon plant from the species, calling it *C. Burmanni*.

In 1861 Planchon and Triana took up the "nomen nudum" *C. Wightianum* Wall. Cat. n. 4847 for Rheede's species, because *apetalum* and *spurium* seemed to them unsuitable, and *C. decipiens* had been misapplied by Thwaites to a Ceylon plant, *C. Thwaitesii* Planch. et Triana. *C. Wightianum* has been accepted in the Flora of British India, in Vesque's monograph of the Guttiferae, and by most recent authors. *C. decipiens*, however, was revived by Dunn in 1915. Under the International Rules of Nomenclature the fact that a name is considered to be misleading or inappropriate does not warrant its rejection, and the correct name for the species in question is *C. apetalum* Willd. Its synonymy is as follows:—

Calophyllum apetalum *Willd.* in Ges. Naturf. Fr. Berl. Mag. 1811, v. 79, excl. stirp. zeylan.

C. spurium Choisy in DC. Prodr. i. 563 (1824); Wight et Arn. Prodr. i. 103 (1834).

C. decipiens Wight, Ill. 128 (1840); Ic. i. t. 106; Dunn in Gamble Fl. Madras i. 76 (1915).

C. Wightianum Wall. Cat. n. 4847 (1831), nomen; Planch. et Triana in Ann. Sc. Nat. sér. 4, xv. 256 (1861); T. Anders in Hook. f. Fl. Brit. Ind. i. 274 (1874); Vesque in DC. Monogr. viii. 569 (1893).

T. A. S. and C. E. C. F.

Xylopia hastarum *M. L. Green.*—In preparing a paper on the "Standard-species of the Nomina Conservanda (Phanerogamae)" it was noticed that two different species had borne the name *Xylopia glabra*. It was originally based by Linné (Syst. ed. 10, 1250: 1759) on *Xylopia pedunculis subunifloris, fructibus glabris*

Pluk. Phyt. t. 238, f. 4, a Barbados plant which Fawcett and Rendle (Fl. Jam. iii. 199: 1914), who have examined the type specimen in Herb. Sloane, identify with *Anona squamosa* L. As has been clearly shown by these authors, Linné subsequently (Sp. Pl. ed. 2, 1367: 1763) added the synonym *Xylopicrum foliis amplioribus nitidis ovatis, petiolis brevibus, fructibus glabris* Browne Jam. 251. The latter is the White Lancewood of Jamaica, and is a true *Xylopia*. Dunal (Monogr. Anon. 121, t. 19: 1817) cited both the Plukenet and the Browne synonyms, but his description and figure of *Xylopia glabra* were taken from a specimen of the White Lancewood of Jamaica, and with this species the name *X. glabra* has since been associated. In accordance with the generally recognized principle that "a wrong identification cannot be treated as a valid name" (*vide* Schinz & Thell. in Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 313; Sprague in Journ. Bot. 1922, 138) it seems desirable to give a new name to the endemic Jamaican species, which has been erroneously identified with *X. glabra* L., and it may therefore be called *X. hastarum* in allusion to the vernacular name "Lancewood."

Xylopia hastarum *M. L. Green*, nom. nov.—*X. glabra* L. Sp. Pl. ed. 2, 1367 (1763), partim; Dunal, Monogr. Anon. 121, t. 19 (1817), excl. syn. Pluk.; Fawcett & Rendle, Fl. Jam. iii. 199 (1914); non L. (1759).

M. L. G.

Index Kewensis, Supplement VI.—The sixth Supplement to the Index Kewensis, which was published on April 23, 1926, continues that work to the end of the year 1920. In addition to names published during the quinquennium 1916–20 it includes many published during the years 1914–15 which, owing to the War, were not available for insertion in Supplement V. The diminution of botanical research during the later years of the War is reflected in the smaller size of the sixth Supplement, which consists of 222 pages compared with 277 in Supplement V.

At the time when the Index Kewensis was originally prepared, the year 1735 was accepted as the starting-point for genera, hence many generic names were inserted in the Index with references which are now invalid under the International Rules of Nomenclature. These are now replaced by references to the first places of publication, starting from the year 1753.

As the result of generic segregation it sometimes happens that the same generic name, ascribed to the same author, is applied in two or more mutually exclusive senses by different writers. Thus the name *Achyranthes* is nowadays given to two distinct genera which were originally included in *Achyranthes* L. For convenience of consultation such different applications of the same generic names are indexed separately.

The publication of this Supplement has been considerably accelerated by three annual grants received from the British Association. This generous assistance has also been of great help in expediting the work now in progress on Supplement VII, which deals with the names published during the years 1921–1925.

East African Grasses.*—With the object of assisting officials and residents in Tropical Africa to recognise their local pasture plants, a small book comprising descriptions and illustrations of twenty common East African grasses has been prepared at Kew for the Governments of British East Africa. The work originated from a suggestion made by the Veterinary Adviser to those Governments, and it is hoped that the book will be the first of a series which will eventually cover the whole flora.

In the introduction a typical grass plant is described in simple language, and details of the floral structure are given, with illustrations of the essential parts. There is also a simple account of the general principles on which the classification of the grasses is based. Each species is illustrated by a text figure, which occupies a whole page and is accompanied by a full description in simple language, together with notes on the vernacular names, distribution, habitat and economic uses. It is hoped that by means of the illustrations, which have been specially prepared for this work, and the descriptions, the plants may be recognised in the field even by persons who have not had the advantage of previous botanical training.

The Pruning of Trees and Shrubs.†—This little volume of ninety-two pages should prove of great value to both amateur and professional cultivators of trees and shrubs. It is based on Mr. Dallimore's long experience at Kew and embodies the principles and practice of pruning as it is carried on there. The book may be especially recommended to the Superintendents of public parks and gardens in this country, where the pruning of shrubs is little understood and, in fact, very often degenerates into a mere clipping. A very useful feature of the book is the advice it gives on the treatment of old and neglected trees, a matter about which a great number of enquiries are addressed to Kew. Still the whole book is packed with valuable information, written in concise and untechnical language, and reflects great credit on its author and publishers.

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* East African Pasture Plants. 1. East African Grasses. The Crown Agents for the Colonies, 4, Millbank, London, S.W. 1926, pp. 56, text figs. 28. Price 2s. 6d.

† By W. Dallimore. Dulau & Co., 34, Margaret Street, W. 1, 1926, pp. 92. Price 4s. 6d.

Printed under the authority of His Majesty's Stationery Office
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BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1926

ROYAL BOTANIC GARDENS, KEW

XXXIV.—THE FUSARIA OF JAMAICA.

C. G. HANSFORD, *Microbiologist, Dept. of Agriculture, Jamaica.*

INTRODUCTORY.

In connection with experimental work on the Panama Disease of the Banana (*Musa sapientum*), the writer found it necessary to examine the *Fusarium* flora of a large number of soil samples. In the course of this work a large number of strains of *Fusarium* was isolated, and the present paper represents an attempt to classify these strains into species as far as is possible, and to correlate these with species previously described. Not only were many of these *Fusaria* isolated from soil samples, but many others were obtained from plant specimens and debris collected from time to time. While no claim is advanced that the complete *Fusarium* flora of Jamaica is represented in the present work, it is hoped that this will serve as a basis for future work, and a slight contribution towards our knowledge of the distribution of the various species of the genus.

With the exception of the *Fusarium* causing the Panama Disease of the Banana (*Fusarium cubense* Smith, emend. Brandes) the various species enumerated here have been studied only from a purely morphological standpoint. The writer hopes to be able to carry out extensive inoculation experiments with these species in the near future, to test the pathogenicity of each group of strains. Many strains of *Fusarium* have been isolated during the present work from diseased portions of plants other than the banana, but whether these strains were the actual causes of the symptoms observed cannot be stated definitely at the moment. In Jamaica it has been found that the dead and dying roots of many different plants contain various strains of *Fusarium* in the tissues, and that the plants themselves show the symptoms of a wilt disease. The greater number of the *Fusaria* found in such situations are undoubtedly saprophytic in habit, but it is more than probable that some are to some degree parasitic, causing wilt symptoms in the plants attacked. Not only is it important to decide whether or not these fungi are parasitic in habit, but also the conditions under which they are able to attack these plants must be determined in the case of those strains found to be parasitic. Also very little work has been done up to the present in determining the host range of the various members of the genus known to be parasitic.

(585) Wt. 55—7. 1,000. 7/26. Wy. & S., Ltd. **Gp. 50** (4).

Many of the strains used in the course of the present work were isolated from soil samples collected from various parts of Jamaica. The isolation of *Fusaria* from these soil samples was accomplished by one of the two methods outlined below.

In many cases the specimens as received in the laboratory consisted of a single lump of moist clayey soil, and it was found necessary to carry out some preliminary manipulations before proceeding to the actual isolation of the *Fusaria*. The soil was broken up and exposed to the air to dry, after which it was reduced to a coarse powder. Then in this form it was used for the isolation of the fungi.

Method 1.—A little of the powdered soil was added to a tube of sterile water and shaken up. A little of this suspension was used to inoculate a series of Potato Agar dilution plates. These were incubated at the ordinary room temperature for about four days, when they were examined, and any colonies of *Fusarium* which appeared were transferred to tubes of the same medium. After about ten or fourteen days these tubes were examined and duplicates were discarded as far as possible, at this early stage. The remaining cultures were plated out in an ordinary dilution series, from which "Single Spore Strains" were isolated of any strains which appeared to differ in any respect. Usually it was found that the original tube culture made by transfer from the plates of soil was a pure culture of a single *Fusarium* as shown by the uniformity of the colonies obtained in the second dilution series from it. In a few instances, however, the original tube cultures were contaminated with bacteria, and in some cases were found to be a mixture of two *Fusaria*. Eventually each distinct strain isolated from a given sample of soil was obtained as a "single spore strain" in pure culture. These cultures were kept as stock cultures for use in the comparison of the strains with each other. This method of isolation proved extremely laborious and various modifications were tried with the object of saving as much time and labour as possible, with the result that another method was used in the latter part of the work, the former method described above being used occasionally as a check upon the second and shorter method.

Method 2.—A thick paste of starch, preferably "semolina" or "ground rice," was made up with cold water, and spread in a layer of $\frac{1}{16}$ to $\frac{1}{8}$ inch thick over the bottom of large Petri dishes about 8 to 12 inches in diameter, and about $\frac{3}{4}$ to 1 inch in depth inside. The covers were placed over the dishes, and the whole sterilised in the autoclave for 20 minutes at 15 lbs. pressure. On cooling the plates were taken out and placed in a sterile chamber. The soil specimens, prepared as described above, were sifted lightly over the surface of the paste in the dishes under as sterile conditions as was possible. Not only did this medium prove an excellent one for the development of the *Fusaria* at the expense of certain other common

saprophytes, but they developed the colours on the rice medium which are typical of the sections of the genus to which they belong. After about four days it was an easy matter to distinguish the colonies of the various fungi growing in the dishes from each other. From the *Fusarium* colonies a few spores were taken and inoculated into a dilution series of Petri dishes of Potato Agar, from which single spore strains were isolated in the usual way. In the case of those *Fusarium* colonies which did not form spores on the paste in the large dishes, a little of the colony was transferred to a tube of Potato Agar, on which medium spores were usually formed in quantity. From this culture, in turn, a single spore strain of each strain was isolated in the usual way.

This method proved much less troublesome than the first, as the original colonies of *Fusarium* were not contaminated with bacteria to the same extent as those developed by the planting of the soil specimens on the Potato Agar as in the first method. Most of the colonies on the starchy paste developed much aerial mycelium in those cases where large quantities of conidia were not formed, and this aerial mycelium was used as inoculum for a culture on Potato Agar, on which spores were formed quite readily. The paste proved a good medium for the cultivation of the *Fusaria* in the soil specimens at the expense of other soil fungi which were not wanted in the present work. The only exceptions to this general rule were species of *Mucor* and of *Oedocephalum* which overran the colonies of *Fusarium* in both the paste and the agar plates.

Most of these soil specimens were examined with the original intention of determining whether or not they contained *Fusarium cubense*, the organism causing the Panama Disease. By the second method of isolation it was much easier to recognise the colonies of the *Elegans* group, to which *F. cubense* belongs, as they give a delicate pink-tinted, well developed aerial mycelium under such conditions. Special attention was given to this section of the genus during the whole of the present work.

Many of the strains used during the course of the work were isolated from dead and dying banana material (" trash "). These strains were usually isolated direct from the colonies developing on the surface of the " trash " when this had been kept for a day or two in a moist chamber. All strains were finally isolated as " single spore strains."

In the case of the large number of strains isolated from the vascular bundles of banana plants affected with the Panama Disease, small pieces of the affected bundles were cut out from the tissues showing the first stages of the disease, and were planted in dishes of agar, or starch paste, under sterile conditions. The second method proved more rapid than that using agar, but in many cases both methods were used for the same specimen. All strains thus isolated were re-isolated as " single spore strains."

Those strains isolated from fruit and tuber rots were obtained by planting pieces of the rotting tissues in Potato Agar plates. The

portions used for these plantings were cut under sterile conditions from the advancing edges of the rot, and almost always gave pure cultures of the *Fusarium* contained in the rot.

Classification of the Genus Fusarium.

Link, Mag. Ges. nat. Freunde, 3 : 10. 1824. Saccardo, Sylloge Fungorum, 4 : 694. 1886. Appel & Wollenweber, Arb. K. biol. Anst. Land.- u. Forstw. 8 : 60–61. 1910. Wollenweber, Phytopathology, 3 : 24–50, 197–240. 1913. Wollenweber, Ber. deut. Bot. Gesell. 31 : 17. 1913. Wollenweber, Journ. Agric. Res. 2 : 251–285. 1914. Sherbakoff, Cornell Univ. Exp. Sta. Mem. 6 : 1915.

The modern conception and diagnosis of the genus is due to the work of Appel and Wollenweber, continued by Wollenweber in his more recent papers. Their description of the genus, as translated by Morris and Nutting (5), is as follows :

" *Synonomy : Atractium,* Link, p.p. in Mag. Ges. Nat. Freunde, 3 : 10. 1809. *Fusidium,* Link, p.p. in Mag. Ges. Nat. Freunde, 7 : 10. 1816. *Fusidium,* Link, p.p. in Spec. Plant. 11 : 96. 1825. *Fusisporium* Link in Spec. Plant. 1 : 30. 1824. *Selenosporium* Corda Icon. 1 : 7. 1837. *Fusoma* Corda Icon. 1 : 7. 1837. *Pionnotes* Fries Sum. Veg. Scand. 481 : 1849 ; Sacc. Syll. 4 : 725.

" Conidia more or less polar, mostly dorsiventral, seldom distinctly round (radiar), more or less curved ; when ripe usually septate ; more or less coloured when in masses ; borne one after another in the same spot, but not connected in chains, on the ends of simple or branched septate conidiophores, which appear spread out between the hyphae or joined as they are in coremia, or grouped together in sporodochia. Conidia spread out in a powdery form between the hyphae or tubercular-like on a limited gelatinous sporodochium, a slimy layer, or occasionally as pionnotes without definite boundaries. Chlamydospores oval or pear-shaped, single or in bunches, in chains or bunched up, remaining joined for some time, terminal or intercalary, not more than one borne in the same place. The chlamydospore is not very different from the conidiophore and it has no distinctive colour. It never gathers in gelatinous layers.

" Hyphae septate, variously branched, epi- and endo-phytic, occurring sparingly or in great quantity, either isolated or together, curly or thick, partly like coremia or especially like a stroma to plectenchymatic form with definite shape or without definite shape, more often similar to an even growth all over, limited or spread out, often closed up together on the inside, occasionally building up bright mycelium. Note that it is undecided whether species that do not have septate conidia should be kept separate from the genus, or be placed in a subgenus *Fusamen,* according to Saccardo (6) ; but there is no question about those which have a tendency towards septation as *F. orthoceras.* It is also undecided in what order of importance the characters should be taken. The choice is between septations, dorsiventrality, polarity, and the curve of the long axis of the conidia. It is very questionable whether *Fusarium* should be placed under *Leptosporium* as in Saccardo, and nothing but the study of the

different forms can decide the boundaries of the genus. Concerning the colour of the conidial masses it can be said that black does not appear normally, neither does black mycelium. Light orange and ochre colours predominate in the conidia. The mycelium has also yellow, red and blue. The term sclerotium as used in *Fusarium* is disputable. Researches have not shown that the term sclerotia was justifiable for the structures found."

Since this, Wollenweber (9) has excluded from the genus *Fusarium* all fungi having straight conidia, transferring them to the genera *Ramularia* and *Cylindrocarpon*.

Sherbakoff (7) describes the genus as follows :—

" Hyphomycetes with from hyaline to bright, but never plain grey nor black, conidia and mycelia : conidia sickle-shaped septate (usually 3 or more septate) apically pointed, mostly pedicellate, not appendiculate, not catenulate ; conidia scattered over the substratum, in pseudopionnotes or in sporodochia, the latter with or without from flat to wartlike plectenchymatic substratum, and always without any differentiated or enclosing structures ; conidiophores from simple to irregularly verticillate."

The modern attempts to classify and group the great number of species of *Fusarium* now known, are based on the work of Appel and Wollenweber (1). This work was continued by Wollenweber (8), who has collected the various species into groups of species having related characters. These sections are based chiefly on the shape of the conidia, and those originally described by Wollenweber are still used to-day. The sections *Martiella*, *Discolor*, *Gibbosum*, *Roseum* and *Ventricosum* described by him contain a large number of wound parasites, capable of causing a destruction of parenchymatous tissues. The section *Elegans* contains a number of vascular parasites which cause the wilt diseases of a number of important crops. Wollenweber's later papers have dealt with the grouping of a large number of species in these sections, and other sections have been added to those he originally described. Sherbakoff (7), working in America, described the " Fusaria of Potatoes " occurring there in great detail, and grouped them in Wollenweber's sections as far as was possible, adding other sections where he found it necessary. Owing to the very slight differences between many of his species and varieties, his classification has become much complicated, and had he allowed his conception of the species to broaden a little he would have found many of these to be unnecessary.

As noted by Morris and Nutting (5) the great obstacle in the way of identification work on the species of *Fusarium* is the lack of a good monograph of the genus, and the different conceptions of the boundaries and range of a single species in the genus, as used by the various workers on it. The most comprehensive of the various keys to the species of *Fusarium* is that given by Wollenweber (11) and the present work is largely based on that key. He does not, however,

include in this key many of the species which he mentions in a former paper (12), which is much to be regretted.

Wollenweber has recognised that many of Sherbakoff's species are unnecessary, as he has regarded them as synonyms of species previously described.

The Sections and Species Found in Jamaica.

The arrangement of the sections and species followed in this paper is that of Wollenweber and his co-workers, as published in their more recent papers (12, 13 and 14).

Wherever possible I have utilised the descriptions of the various species and varieties published by these authors, so as to avoid unnecessary complication. In each case the author and reference are given.

I.—Section **Eupionnotes** Wr.

Wollenweber, Phytopathology 3: 38. 1914. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ann. Myc. 15; 53. 1917; Ber. d. Deut. Bot. Ges. 35: 732. 1918. Reinking & Wollenweber, "Fusaria in Relation to Banana Cultivations."* United Fruit Co., Boston, 1925.

Reinking and Wollenweber give the following diagnosis of this section:

"Eupionnotes always present, spread out, dense, typical aerial mycelium absent, orange to salmon; conidia nearly cylindrical to sickle-shaped, moderately curved, slightly dorsiventral, apex ellipsoidal to conical, basis mostly apedicellate, septate, but septa frequently inconspicuous; chlamydospores one-celled, two-celled, in chains, rarely in heaps, or absent. Color type, orange to bright salmon."

1. **Fusarium affine** *Faut. & Lamb.*

Fautrey & Lambotte, Rev. Myc. Fr. 18: 68. 1896. Saccardo, Sylloge Fungorum 14: 1125. 1899. Sherbakoff, Cornell Exp. Sta. Mem. 6: 126. 1915.

Sherbakoff's description of the fungus is as follows:—

"Conidia straight, somewhat dorsiventral near apex, apedicellate, typically 1-septate, $10{\cdot}2 \times 2{\cdot}8$ $(9-11{\cdot}4 \times 2{\cdot}6-3)\mu$, usually in a continuous smooth or slightly roughened slimy layer, from hyaline to pale salmon-coloured on glucose agar; conidiophores from simple to sparingly branched, septate; mycelium hyaline; no chlamydospores.

"Hab. In tubers and stems of *Solanum tuberosum*, in greenhouse soil, New York.

"This organism was isolated repeatedly from various sources such as discoloured fibrovascular bundles of potato tubers from the base of wilted potato stems and from soil. Its size is exactly the same as that given by Wollenweber (9) for the conidial stage of *Mycosphaerella solani* (E. & E.) Wr. Wollenweber's illustrations (Plate xxi, Fig. N) are also much the same, and he considers *F. affine* Faut. & Lamb. as the conidial stage. The strain studied did not show any perfect form in culture, although it was grown for more than a year and on various media. This organism can be at once distinguished from all the other Fusaria by its minute, 1-septate, nearly straight conidia, and its inconspicuous slow growth."

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* References to this work are from a mimeographed copy kindly supplied to me.—C. G. H.

The several strains of this fungus which were studied in the course of the present work agreed very closely with the above description. None of the strains formed any perfect stage in culture. For the identification of this species I am indebted to Dr. Sherbakoff.

In Jamaica the fungus has been found in a rot of the tubers and roots of *Zingiber officinale*, but the writer has not yet been able to test its pathogenicity to the ginger plant.

Wollenweber (12) considers that this species should be referred to the genus *Hymenula* on account of its almost straight conidia.

2. **Fusarium dimerum** *Penzig.*

Penzig, Michelia 2 : 484. 1882. Saccardo, Syll. Fung. 4 : 704. 1886. Lindau, Rab. Krypt. Fl. Pilze, 9 : 566. 1910. Appel & Wollenweber, Arb. K. biol. Anst. Land.-u. Forstw. 8 : 37. 1910. Sherbakoff, Cornell Agr. Expt. Sta. Mem. 6. 1915. Wollenweber, Ann. Myc. 15 : 9. 1917 ; Ber. d. Deut. Bot. Ges. 35 : 732. 1917.

Reinking and Wollenweber (13, p. 11) give the following diagnosis of this species :

" Pionnotes pale cinnamon-pink to orange-pink, moderately spread out ; tubercular sporodochia present ; conidia curved, approaching pedicellate, typically 1-septate, $13{\cdot}5 \times 2{\cdot}75$ ($8-18 \times 2{\cdot}0-3{\cdot}5$) μ, often 0-septate, $12 \times 2{\cdot}75$ ($4{\cdot}5-16 \times 2{\cdot}0-3{\cdot}5$)μ ; stroma erumpent, chlamydospores 3·5–6 μ diam. in mycelium and conidia.

" Habitat : On cut surface of decaying banana pseudostem and in the soil, Tela, Honduras, Central America."

A culture of this organism was isolated by the present author from some decaying wood debris at Hope, and was found to agree with the above description. The measurements of the conidia on different media agree with those given by Reinking and Wollenweber (loc. cit.) rather than with those of Sherbakoff (loc. cit. p. 128) who gives the average width of conidia considerably larger than those found in my cultures.

V.—Section **Arthrosporiella** Sherb.

Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ber.-d. Deut. Bot. Ges. 35 : 733. 1917. Wollenweber & Reinking, Phytopathology 15 : 157. 1925.

Wollenweber and Reinking (loc. cit.) give the following diagnosis :

" Aerial mycelium abundant, whitish to flesh colour, sporodochia and pionnotes present ; microconidia in aerial mycelium, spindle-shaped or lanceolate, apedicellate, 0–3-septate ; macroconidia in masses, isabella color or ochraceous, sickle-shaped, attenuate, often pedicellate, 3-more septate ; chlamydospores typically intercalary, stroma ochraceous to chestnut-brown or rosy, spread out, sometimes sclerotially erumpent."

3. **Fusarium semitectum** *Berk. & Rav.*

Berkeley, Grevillea 3 : 98. 1875. Saccardo, Syll. Fung. 4 : 718. 1886. Wollenweber, Ann. Myc. 15 : 11. 1917. Wollenweber & Reinking, Phytopathology 15 : 157. 1925.

" Aerial mycelium white to flesh colour or isabella colour, stroma plectenchymic, dark ochraceous sometimes violet-carmine ; chlamydospores intercalary ; sporodochia absent, conidia scattered in aerial mycelium, spindle-shaped,

lanceolate, slightly curved, apedicellate, appendicular, when smaller 0–2-septate, when larger 3–5- (6–7) septate; 0-septate 12×3·0—3·5 μ; 1-septate 11—21×2·5—4·5 μ; 2-septate 16—24×3·25—5·0 μ; 3-septate 18 — 40×3·0 — 5·5 μ; 4-septate 29 — 45×4·0 — 5·5 μ; 5-septate 36—52×4·0—5·5 μ; 6–7-septate 37—57×4·5—5·5 μ.

"Hab. At blossom end rot of tomato, in dead floral parts, decaying fruit and interior of pseudostem of diseased banana plant (*Musa sapientum*), and in the air. Honduras, Central America."

In Jamaica this species has been found on the remains of the flowers at the end of banana fruits, and also once from decaying banana fruit (*Musa cavendishii*), in this case apparently having spread from the decaying floral parts back into the fruit itself.

In culture the organism appeared to satisfy the above diagnosis, except that it did not develop any violet carmine colour in culture. Reinking and Wollenweber (13, p. 17) mention that some strains of this organism do not develop this colour.

4. **Fusarium anguioides** *Sherb.*

Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915.

Sherbakoff describes the species as follows:

"Conidia of diverse type ranging from arthrosporial (short spindle-shaped with more or less rounded ends, 0- and 3-septate) to typically slightly curved or nearly straight and anguiform, 1- to 15-septate, 1- and 3-septate conidia typical for the first form and measuring 27×4·4 (20—38×3·9—5·3) μ; for the other form the conidia commonly measuring as follows:

5-septate, 51×4·2 (47—68 ×3·9—4·6) μ.
6–7-septate, 76×4·6 (65—86 ×4·2—5·2) μ.
8–9-septate, 89×4·86 (80—102×4·3—5·8) μ.

Colour of conidia in pseudopionnotal layer, on glucose potato agar, ranging from light pinkish cinnamon to cinnamon; arthrosporial conidia of common occurrence on aerial mycelium but often the latter, especially on different agars, nearly absent, when a thin spore layer, pseudopionnotes, is produced for which anguiform conidia are typical."

In Jamaica the present writer has isolated cultures of this species from decaying plant debris and from soil in several districts, and it appears to be a common saprophyte in these situations. I am indebted to Drs. Reinking and Wollenweber for the identification of my cultures of this organism. They remark as follows (13):

"The writers observed in addition, intercalary chlamydospores in mycelium and conidia; no sporodochia were observed, but pionnotes developed. . . . The main part of the spores are developed from the mycelium. *F. anguioides* represents a border line strain to section Roseum, and resembles in some characters *F. anthophilum* (A. Br.) Wr., from which it differs in higher septation of conidia, and by the presence of chlamydospores."

VI.—Section **Gibbosum** Wr.

Wollenweber, Phytopathology 3: 31. 1913. Sherbakoff, Cornell Exp. Sta. Mem. 6. 1915. Wollenweber, Ber. d. Deut. Bot. Ges. 35: 734. 1917.

Reinking and Wollenweber (13, p. 32) give the following diagnosis of this section:

" Mycelium from white to brown ; conidial mass typically pale buff to cinnamon and sepia ; conidia in sporodochia and pionnotes, pale ochraceous to orange, dorsiventral sickle-shaped, elliptical with parabolical or hyperbolical curves, attenuate at both ends, pedicellate ; sometimes smaller conidia in aerial mycelium, comma-shaped, 0–3-septate, rounded at both ends or slightly constricted, apedicellate ; chlamydospores intercalary in mycelium and conidia, sclerotia rare, sometimes dark blue ; stroma plectenchymic, ochraceous, chestnut brown or carmine."

5. **Fusarium bullatum** *Sherb.* var. **minus** *Wr. & Reinking.*

Wollenweber & Reinking, Phytopathology 15 : 159. 1925.

" Differs from the type species by smaller conidia ; conidia in sporodochia or in pionnotes, pedicellate, mostly 3-septate 21—40×3·0—4·0 μ ; seldom 4–5-septate ; 5-septate 33—42×3·5—4·5 μ ; conidia in aerial mycelium sometimes subnormal apedicellate, 3 (1–5)-septate." (Wollenweber & Reinking, loc. cit.)

This fungus was isolated from rotting plant debris at Hope Gardens, and also from plant debris near the Hope River at Papine.

6. **Fusarium bullatum** *Sherb.*

Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber & Reinking, Phytopathology 15 : 159. 1925.

Sherbakoff's diagnosis is as follows :

" Conidia . . . usually distinctly pedicellate, mostly 5 - septate 42×4·3 (31—47×4·1—4·9) μ, from pale cream to salmon in colour ; chlamydospores intercalary in mycelium mostly in chains and from small to large clusters ; aerial mycelium nearly always well developed, of uniform height and density, nearly pure white in colour ; substratum on various agars from colourless to a tint of light buff."

This species has been isolated in Jamaica by the present author from soil in banana cultivations in Portland and St. Mary, and from plant debris (chiefly parts of old leaves of banana) in these same cultivations.

7. **Fusarium ossicolum** (*Berk. & Curt.*) *Sacc.*

Saccardo, Syll. Fung.. 4 : 714. 1886. Wollenweber, Ann. Myc. 15 : 15. 1917.

This fungus was isolated from dead and decaying banana leaves in Portland and St. Mary, and also at Virgin Valley, St. James, and was identified for me by Drs. Reinking and Wollenweber, whose diagnosis is here given :

" Light orange mycelium and conidial mass ; conidia in sporodochia and pionnotes, curved spindle-shaped, sickle-shaped, middle cells broad in comparison to the longer end cells, end cell often slender, pointed and often curved ; 5 (3–5)-septate, 27—48×3·75—4·5 μ ; 0-septate 9—11×3·0—4·5 μ ; 3-septate, 23–26×3·75 μ ; 4-septate, 23—26×4·5—5·25 μ ; chlamydospores intercalary or sometimes terminal." (13, p. 37.)

8. **Fusarium falcatum** *App. & Wr.*

Appel & Wollenweber, Arb. K. Biol. Anst. Land.-u. Forstw. 8 : 175. 1910. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ann. Myc. 15 : 15. 1917.

" Mycelium white to ochre. Conidial masses ochre, yellowish brown or reddish ochre. Conidia, sporodochia and pionnotes present ; curved spindle-

shaped, sickle-shaped, middle cells very broad in comparison to the much longer end cells, with long and narrow apex, prominently pedicellate, parabolic to hyberbolic curves, typically 5 (3–5)-septate, 46×4·75 (36—65×3·5—6·0) μ; 3-septate, 27×4·0 (23—32×3·5—4·5) μ; 4-septate 37×4·0 (29—42×3·5—4·5) μ; rarer 6–12-septate; 10-septate 83×5·5 μ; chlamydospores 6–14 μ diam., intercalary or sometimes terminal in mycelium and conidia; 1-celled, 2-celled, in chains or masses." (Reinking & Wollenweber, 13, p. 36).

This species has been found in Jamaica in soil and on dead wood and plant debris at Hope Gardens.

9. **Fusarium acuminatum** *Ell. & Ev., emend. Wr.*

Ellis & Everhart, Proc. Acad. Sci. Phila. 441. 1895. Saccardo, Syll. Fung. 14: 1125. 1899. Wollenweber, Journ. Agr. Res. 2: 269. 1914.

Wollenweber gives the following diagnosis:

" Conidia scattered, in sporodochia or in pionnotes, orange in mass; conidia average as follows: 5-septate, 40—70×3·0—4·0 μ; 4-septate (less common) 30—60×3·0—4·5 μ; 3-septate, 20—45×2·75—4·25 μ; 0-, 1-, 2-, 6- and 7-septations occasionally found; subnormal small conidia may easily be mistaken for conidia of the section *Discolor* but normal sporodochia develop on repeatedly whorl-like branched conidiophores, giving the characteristic conidia of the section Roseum; conidia in side view with hyperbolic or parabolic curves, in contrast to *Fusarium herbarum* (Cda.) Fr., the conidia of which are less curved; chlamydospores present, intercalary in mycelium and conidia, sometimes single, but mostly in chains and clusters; blue globose sclerotia, 50—70 μ thick form a striking contrast to the carmine plectenchymatic thallus on starchy media, such as steamed potato tubers. Both blue and carmine are basic modifications of the fungus, while yellow (on rice) is the acid one, turning blue to purple violet with the addition of an alkali."

A culture closely corresponding with the above description was isolated in Jamaica from the rotting tissues of a banana rhizome which had succumbed to the wilt disease. When first isolated the culture agreed very closely with the diagnosis above, except that blue sclerotia were not produced in culture. Soon after the culture was isolated it appeared to undergo some kind of degeneration, and for a period of 18 months no typical sporodochia or pionnotes were formed in any culture made from it. Finally in an old culture on potato tuber plug typical sporodochia were again formed, and subcultures from these have proved identical with the characters of the original isolation. No sclerotia have at any time been produced in cultures of this strain, which is the only representative of this species so far isolated in Jamaica.

Measurements of the conidia are as follows:

On Potato tuber plug, 28 days old, conidia from a large sporodochium:

3-septate 15% 26—48×2·7—4·5 (36×3·7) μ.
4-septate 15% 28—52×3·0—4·5 (41×4) μ.
5-septate 60% 38—76×3·4—4·8 (54×4·3) μ.
6-septate 10% 54—78×4—4·8 (63×4·5) μ.

On Tomato stem plug, 35 days old, conidia from sporodochium:

3-septate 10% 30—54×3—4·7 (42×3·8) μ.
4-septate 15% 33—60×3—4·8 (48×4) μ.
5-septate 65% 41—75×3·3—5 (58×4·3) μ.
6-septate 10% 56—80×4—4·8 (66×4·5) μ.

10. **Fusarium caudatum** *Wr.*

Wollenweber, Journ. Agric. Res. 2 : 262. 1914.

" Conidia with a tail or whip-like prolongated apical cell and a pedicellate base with well marked heel, ochreous to salmon coloured in mass, formed in sporodochia and pionnotes ; 5-septate conidia averaging 40—80 × 3·0—4·5 μ, lower and higher septations more rarely occur ; chlamydospores brown, 7—14 μ diam., as a rule intercalated in chains or clusters, but frequently single if formed from the content of the cells of conidia under poor conditions, such as in water." (Reinking & Wollenweber, 13, p. 43.)

This organism was isolated twice, from soil, and from the vascular bundles of a banana (*Musa sapientum*) attacked by wilt disease, where it was a secondary invader, following on the *Fusarium cubense* causing the disease. The culture was identified for me by Drs. Reinking and Wollenweber.

VII.—Section **Roseum** Wr.

Wollenweber, Phytopathology 3 : 32. 1913. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ber. d. Deut. Bot. Ges. 35 : 739. 1917.

" Conidia broad ellipsoid, typically of an even diameter for a considerable part of their length, comparatively narrow, very gradually attenuate toward both ends, approaching sickle-shaped, top cell long, sometimes narrow filiform, base more or less pedicellate ; chlamydospores absent ; some species have blue coloured sclerotia. Color type : acid modification of aerial mycelium yellow, except in *F. anthophilum* and other related fungi." (13, p. 46).

11. **Fusarium herbarum** (*Cda.*) *Fr.*

Wollenweber, Ber. d. Deut. Bot. Ges. 35 : 739. 1917.

" Sporodochia minute, confluent, yellow, stromata sometimes carmine spotted ; conidia for the most part 5-septate, 48—56 × 4—4·5 μ, (when dry 3–4 μ broad), 3-septate 35–45 × 3·5—4·25 μ, blue globose sclerotia very rare, 40—80 μ diam." (11, p. 739.)

The present writer isolated an organism of this type only once during the course of the present work, from some dead twigs of *Coffea arabica*. The following is a description of these cultures :

Conidia from almost straight to elliptically curved, of even diameter through most of their length, with acute, attenuated apex, base pedicellate, produced in yellowish to pink sporodochia and in pseudopionnotes ; aerial mycelium white to pink, in some cultures almost entirely wanting ; no chlamydospores ; blue sclerotia produced only very rarely and very small ; substratum from almost hyaline to pink and brown shades, sometimes carmine.

Measurements of the conidia on different media are as follows :

On tomato stem plug :

3-septate 30% 30—40 × 3·5—4 (37 × 3·6) μ.
4-septate 30% 40—48 × 3·5—4·2 (43 × 4) μ.
5-septate 40% 40—50 × 3·5—4·5 (46 × 4) μ.

On potato Agar, culture 21 days old :

3-septate 60% 25—40 × 3—3·5 (32 × 3·5) μ.
4-septate 20% 37—45 × 3—4 (40 × 3·5) μ.
5-septate 20% 40—50 × 3—4 (46 × 3·5) μ.

On wood plug, conidia from large pink sporodochium :

3-septate 60% (30×3·2) μ.
4-septate 30% (38×3·2) μ.
5-septate 10% 36—48×3—4 (43×3·5) μ.

On potato tuber plug, 35 days old culture :

3-septate 50% 25—50×3—4 (42×3·8) μ.
4-septate 25% (43×4·2) μ.
5-septate 20% 40—60×4—4·5 (48×4·2) μ.
6–7-septate 5% 50—60×4—5 (53×4·5) μ.

12. **Fusarium herbarum** (*Cda.*) *Fr.* var. **gibberelloides** *Wr.*

Wollenweber, Ber. d. Deut. Bot. Ges. 35 : 740. 1917.

The following is a translation of Wollenweber's diagnosis :

" Differs from the type by the numerous large globose to warty sclerotia, which are blue-black like those of Gibberella." (loc. cit.)

A culture corresponding to the above diagnosis has been isolated in Jamaica on some dying *Citrus* twigs by the writer, whose cultures are thus described :

Conidia 5-septate, some 3-4 and 6-septate, of even diameter through most of their length, elliptically curved to almost straight, pedicellate, with acute ends, of uniform curvature, with acute attenuated apex ; no chlamydospores ; large blue-black nodulose sclerotia ; mycelium usually poorly developed, white to pink in colour as a rule, occasionally yellowish ; conidia produced in large yellowish sporodochia and in pseudopionnotes, plectenchymata red to brown in colour.

Measurements of the conidia are as follows :

On wood plugs, conidia from a large sporodochium in a culture 21 days old :

5-septate 95% } 50—60×4—5 (54×4·5) μ.
6-septate 5% }

On tomato stem plug, conidia from pseudopionnotes, culture 21 days old :

3-septate 30% 35—52×3·5—4 (42×3·8) μ.
4-septate 30% 37—60×3·5—4·5 (45×4·2) μ.
5-septate 40% 40—60×4—4·5 (52×4·3) μ.

13. **Fusarium avenaceum** (*Fr.*) *Sacc.*

Wollenweber, Ann. Myc. 15 ; 14. 1917, gives the following synonomy :

F. Gaudefroyanum Sacc. ; *F. subulatum* App. & Wr. ; *F. lucidum* Sherb.

The following description is taken from the present writer's cultures, and agrees fairly well with the descriptions of *F. subulatum* and *F. lucidum* given by Sherbakoff (7) :

Conidia entirely macroconidia, elliptically curved to almost straight, of uniform diameter through the greater part of their length, gradually attenuated toward both ends, apex prolonged, curved, acute, base distinctly pedicellate, typically 3-septate, averaging 28 × 4μ, 4-septate averaging 32 × 4μ, 5-septate averaging 36 × 4·2μ, and 6-7-septate averaging 45 × 4·5μ, produced in numerous small to large and convex sporodochia, also occasionally

converging into pseudopionnotes, from pale pink in colour to dirty cream or buff shades, no chlamydospores; no sclerotia; aerial mycelium well developed, from almost white to pale pink and cinnamon in colour; substratum from pale pink to brown in colour.

Measurements of the conidia on various media are as follows :—
On wood plug, culture 21 days old :

Conidia : 3-septate 20% 23—32×3·5—4·5 (27×4) μ.
4-septate 30% 25—35×3·5—4·5 (30×4) μ.
5-septate 40% 30—40×3·5—5 (36×4) μ.
6–7-septate rare 40—44×4·5 (42×4·5) μ.

On potato agar, culture 28 days old, conidia from pseudopionnotes :

3-septate 30% 26—36×3·5—4·2 (31×3·8) μ.
4-septate 10% 26—40×3·5—4·2 (33×3·8) μ.
5-septate 50% 30—45×3·5—4·5 (38×4) μ.
6-septate rare 40—55×3·5—5 (48×4·2) μ.

On tomato stem plug, culture 21 days old, conidia from a large sporodochium :

3-septate 10% (29×3·7) μ.
4-septate 5% (33×4) μ.
5-septate 80% 30—50×3·6—4·7 (44×4·2) μ.
6–7-septate rare 45—70×4—5 (52×4·5) μ.

On oat agar, culture 28 days old :

3-septate 30% (28×3·7) μ.
4-septate 10% (33×4) μ.
5-septate 50% 35—52×3·5—4·7 (39×4·2) μ.
6–7-septate 10% 40—56×3·9—5 (48×4·5) μ.

This fungus has been isolated by the writer in Jamaica from the discoloured vascular bundles of a rhizome of a plant of *Musa sapientum* showing an advanced stage of the wilt disease, and was accompanied by other Fusaria of the *Martiella* group; it has also been isolated from the roots of a dead specimen of *Saccharum officinarum*.

14. **Fusarium anthophilum** (*A. Br.*) *Wr.*

Braun, Rab. Fungi. Europ. no. 1964. 1875; Wollenweber, Ann. Myc. 15 : 14. 1917; Wollenweber & Reinking, Phytopath. 15 : 160. 1925.

" Stroma pale, never carmine, conidia scattered, in pionnotes, seldom in sporodochia, slender, attenuate at both ends, sickle-shaped, similar to *Fusarium herbarum*, pedicellate, 3–5-septate 35—70×2·5—4·0 (30—82×2·5—4·5) μ; rarely 6-more septate, scattered conidia lanceolate, slightly curved, attenuate at both ends, apedicellate or appendicular; chlamydospores absent." (14, 161).

Reinking & Wollenweber (13, p. 47) mention that this fungus is common on decaying and dead parts of various hosts in Central America, and that it can also be quite generally isolated from soil and air there. In Jamaica it would appear that it is not quite as generally distributed as in Central America, as up to the present I have found it in only one locality in Portland, growing on banana trash (debris of leaves, etc.) and on a rotting pod of *Theobroma cacao*.

The measurements of the conidia agree closely with those given by Reinking & Wollenweber (13, pp. 48-50).

VIII.—Section **Liseola** Wr., Sherb., Rkg., Joh., et Bail.

Wollenweber, Sherbakoff, Reinking, Johann & Bailey, Fundamentals for taxonomic studies of Fusarium. Journ. Agr. Research 30 : 833. 1925.

"Microconidia more or less formed in chains, spindle to ovoid in shape; macroconidia slender with a slightly constricted top end, and a pedicellate base, form and colour similar to section Lateritium, scattered, in sporodochia or in pionnotes, brownish-white to orange-cinnamon; chlamydospores absent, stroma white to violet, spread out or erumpent, often with sclerotia. Conidial stage of *Gibberella* section *Lisea* (Sacc.) Wr." (13, p. 50).

15. **Fusarium moniliforme** *Sheld.*

Sheldon, Nebr. Agr. Exp. Sta. Ann. Rept. 1903, 23–32. 1904. Saccardo, Syll. Fung. 22:1485. Wollenweber, Ann. Myc. 15 : 23. 1917. Wollenweber & Reinking, Phytopathology 15 : 162. 1925.

"Microconidia in chains or in false heads, formed in white to Isabella colour aerial mycelium, spindle to ovoid in shape, $5-12\times2{\cdot}25-4{\cdot}0\ \mu$; macroconidia delicate and slender, sickle-shaped, attenuate, pedicellate; scattered or in sporodochia or pionnotes, brownish-white to orange-cinnamon; mostly 3-septate, $30-36\times3{\cdot}0-3{\cdot}5$ $(23-48\times2{\cdot}25-4{\cdot}0)\ \mu$; fewer 1–4–5-septate; 1-septate $12-18\times2{\cdot}25-3{\cdot}5\ \mu$; 4-septate $37-53\times3{\cdot}0-3{\cdot}5\ \mu$; 5-septate $43-66\times3{\cdot}0-3{\cdot}5\ \mu$; chlamydospores absent; sclerotia blue, 0·5 mm. diam.; stroma violet or ochraceous." (14, p. 162).

This fungus has been found in Jamaica on diseased corn seeds (*Zea mays*), on diseased cobs of *Zea mays*, and from the rotting bud leaves of pineapple (*Ananas sativus*) at Hope, in conjunction with *Phytophthora* sp. The organism was also isolated from soil in various districts of Jamaica, and appears to be a common saprophyte.

IX.—Section **Lateritium** Wr.

Wollenweber, Ann. Myc. 15 : 54. 1917. Reinking & Wollenweber, Fusaria in relation to Banana Cultivations. United Fruit Co., Boston, 1925, p. 63.

"Mycelium white, rosy, yellow, sometimes carmine, aerial or immersed; chlamydospores frequently intercalary, but terminal always lacking; sclerotia knotty, rugulose, sometimes dark blue; stroma spread out, erumpent; conidia, spindle to sickle-shaped, dorsiventral difference in curvature more conspicuous towards the apex, constricted at both ends or even pedicellate at the base, resembling section Elegans, in tuberculate sporodochia, often protruded in long columns, in pionnotes or scattered in aerial mycelium. Imperfect stage of a *Gibberella*. Colour type similar to section Elegans, and sometimes to Discolor." (13, p. 54.)

16.—**Fusarium fructigenum** *Fr.* var. **maius** *Wr.* Forma 1, *Wr. & Rkg.*

Wollenweber & Reinking, Phytopathology 15 : 165. 1925.

"Conidia in sporodochia and pionnotes, orange, spindle to sickle-shaped, dorsiventral difference in curvature more conspicuous towards the top cell than in the middle, constricted at both ends or even pedicellate at the base, 5(3–6)-septate; 5-septate $48-64\times3{\cdot}5-4{\cdot}5\ \mu$; 6-septate $63-80\times3{\cdot}5-4{\cdot}75\mu$; 3-septate $34-44\times3{\cdot}5-4{\cdot}5\ \mu$; chlamydospores seldom present; sclerotia ($\frac{1}{2}$mm. diam.) dark blue or ochraceous white; stroma carmine. Differs from the type by carmine colour of the stroma." (14, p. 165).

This fungus was isolated only once in Jamaica by the present writer from an undetermined dead plant at Hope. It was identified for him by Drs. Reinking & Wollenweber.

X.—Section **Discolor** Wr.

Wollenweber, Phytopathology 3 : 31. 1913. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6, 1915. Wollenweber Ann. Myc. 15 : 54. 1917 ; Ber. d. Deut. Bot. Ges. 35 : 736. 1917. Wollenweber et al, Journ. Agr. Res. 30 : 842. 1925.

Sherbakoff defines this section as follows :

" Conidia sickle-shaped, at the middle nearly cylindrical, or broader towards the apex, somewhat abruptly apically attenuated, distinctly pedicellate ; mostly 3- to 5-septate, 5-septate dominant ; microconidia typically absent ; chlamydospores intercalary only, usually scant ; mycelium typically well-developed with from nearly white to orange colour as type. Substratum from nearly colourless to chamois, pomegranate purple and spectrum red. Colour of conidia very variable, mostly cinnamon to orange."

17.—**Fusarium sulphureum** *Schlecht.*

Schlechtendal, F. berol. 2 : 134. 1824. Appel & Wollenweber, Arb. K. Biol. Anst. Land-u. Forstw. 8 : 115. 1910. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6 : 1915. Wollenweber, Ann. Myc. 15 : 21. 1917 ; Ber. d. Deut. Bot. Ges. 35 : 737. 1917. Morris & Nutting, Journ. Agr. Res. 24 : 360. 1923.

A description of the present writer's cultures is as follows :—

Conidia entirely macroconidia, elliptically curved, or more or less uniform diameter through most of their length, apex short, abruptly attenuated, base distinctly pedicellate, produced in salmon coloured sporodochia and pseudopionnotes, 3-5-septate $23-40\times3{\cdot}5-4{\cdot}5\mu$. Aerial mycelium white at first, then covered by pionnotes. No sclerotia, no chlamydospores, substratum colourless to slightly brown.

Saprophyte on plant debris and in soil.

Measurements of the conidia are as follows :—

On hard oat agar, culture 14 days old :

3-septate 20% $20-30\times3{\cdot}5-4{\cdot}5$ $(25\times4{\cdot}3)$ μ.
4-septate 20% $22-35\times3{\cdot}5-4{\cdot}5$ $(29\times4{\cdot}3)$ μ.
5-septate 60% $27-40\times3{\cdot}7-4{\cdot}5$ $(33\times4{\cdot}4)$ μ.

On wood plug, culture 21 days old :

3-septate 40% $22-34\times3{\cdot}5-4{\cdot}5$ $(26\times4{\cdot}2)$ μ.
4-septate 20% $24-36\times3{\cdot}5-4{\cdot}5$ $(29\times4{\cdot}3)$ μ.
5-septate 40% $26-42\times3{\cdot}5-4{\cdot}5$ $(34\times4{\cdot}4)$ μ.

Cultures of this species have a pronounced tendency after continued culture on artificial media to produce great quantities of yellowish brown aerial mycelium, and to lose the power of forming typical sporodochia and pseudopionnotes. Such cultures approach very closely to those described by Sherbakoff as members of his section "*Ferruginosum*" (7) except that chlamydospores are absent. The conidia in such cultures are formed in small white groups on short branches of the aerial mycelium, and appear as white spots to the naked eye.

18.—**Fusarium stictoides** *Mont.*

Dur. & Mont. Flor. Alg. 1 : p. 334, Syll. Crypt. n. 1089. Saccardo Syll. Fung. 4 : 706. Wollenweber, Ber. d. Deutsch. Bot. Ges. 35 : 737. 1917.

Conidia of even diameter through most of their length, elliptically curved, curvature uniform, apex abruptly attenuated to slightly acute, base pedicellate, mostly 5–(7–) septate, averaging for 5–septate conidia 60 × 5μ produced in bright orange coloured sporodochia and in pseudopionnotes; aerial mycelium usually scanty, from white to same colour as conidia; chlamydospores few, intercalary; no sclerotia; substratum from almost colourless to brown shades.

Saprophyte on plant debris in Jamaica.

Measurements of the conidia on various media are as follows :—

On hard oat agar, culture 28 days old :

5-septate 80% 55—75×4·3—5 (63×4·7) μ.
6-septate 5% 60—80×4·5—5 (65×4·9) μ.
7-septate 15% 60—90×5 (72×5) μ.

On tomato stem plug, culture 21 days old :

5-septate 90% 48—65×4·3—5 (57×4·8) μ.
6-septate 8% 49—71×4·5—5·2 (60×4·9) μ.
7-septate 2% 60—72×5—5·2 (64×5·1) μ.

On wood plug, culture 21 days old :

5-septate 80% average 58×4·7 μ.
6-septate 15% average 61×5 μ.
7-septate 5% average 63×5 μ.

XIII.—Section **Elegans** Wr.

Wollenweber, Phytopath. 3 : 28. 1913. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ber. d. Deut. Bot. Ges. 35 : 741. 1917.

" Microconidia usually simple, 5—12×2·0—3·5μ; macroconidia free, in tubercular sporodochia or confluent pionnotes, straight in some species, more or less sickle-shaped in others, end cells more curved than those in the centre, from acuminate to constricted base more or less pedicellate; blue sclerotia formed in many species. This section, otherwise very much like Lateritium, differs from the latter by having a large number of microconidia and terminal chlamydospores. Colour type vinaceous to violet." (13, p. 72.)

During the course of the present work special attention was given to this section of the genus. Over 300 strains were isolated belonging to this group, and all were studied in detail. Of these strains about 100 were isolated from the vascular bundles of banana plants suffering from the Wilt Disease (Panama Disease). All these isolations were made from those parts of the vascular system of affected plants which showed the earliest stages in the progressive discoloration of the bundles, which is one of the characteristics of this disease. The cultures thus obtained were again isolated as " single spore strains " and then compared with each other, and grouped according to their morphological characters as shown in artificial culture. These strains from the banana were classified into the following groups or " species " :

Group A.—Macroconidia of typical Elegans type; gradually pointed towards the apex, cylindrical in middle part; usually distinctly pedicellate, almost entirely 3-septate, averaging 26 × 4.3 (25 — 30 × 4 — 4.5) μ, produced in sporodochia and in pseudopion-

notes : 4–septate conidia rare in artificial culture, though produced in abundance in the sporodochia formed on the leafstalks of the host plant.

Microconidia usually in great excess in artificial culture, from almost cylindrical to curved, usually with rounded ends, occasionally somewhat pointed, of even diameter through most of length, 0– and 1– septate, 0–septate averaging 7 × 3.5μ, 1–septate averaging 13 × 3.7μ.

Conidia in mass from white to pink in colour ; aerial mycelium well developed, 3.5 to 5 mm. high, from white to pink in colour ; chlamydospores numerous, both terminal and intercalary ; substratum from colourless to vinaceous purple ; sclerotia constantly developed in cultures on potato tuber plugs ; dark blue to almost black in colour.

This group was found to comprise some 57 different strains of the present series, and was found in banana plants from every district in Jamaica where the wilt disease occurs.

Specimen measurements of conidia on various media are given below :—

On potato agar, culture 21 days old :

Conidia 0-septate 70% 3—12×2·5—4 (6·5×3·5) μ.
1-septate 10% 8—21×3—4 (12·5×3·5) μ.
3-septate 20% 19—31×3—4·5 (25×4) μ.

On hard potato agar, culture 14 days old :

0-septate 40% 3—13×2·5—4 (7×3·5) μ.
1-septate 15% 7—17×3—4 (13×3·7) μ.
3-septate 45% 18—29×3—4·5 (25×4·2) μ.

On wood plug, culture 21 days old :

0-septate 20% 3—12×2—3·8 (7·3×3·3) μ.
1-septate 15% 7—22×3—4 (14×3·8) μ.
3-septate 65% 21—34×3—4·2 (27×4) μ.

On tomato stem plug, culture 21 days old :

0-septate 20% 5—12×2·5—4 (8×3·5) μ.
1-septate 30% 9—19×3—4 (14×3·8) μ.
3-septate 50% 18—38×3·5—4·5 (29×4·2) μ.

Group B.—A small group of only 6 strains. This group differs from the cultures belonging to group A only in that sclerotia are never produced by the strains of this group, though grown repeatedly under the same conditions as the strains belonging to group A. During the 18 months that the 6 strains of this group were kept in culture for comparison with those of group A, sclerotia were never formed on any medium.

Measurements of the conidia on various media are as follows :—

On potato agar, culture 42 days old :

0-septate 60% 5—12×2·5—4 (7×3·5) μ.
1-septate 30% 7—23×3—4 (14·8×3·5) μ.
3-septate 10% 19—34×3—4·5 (28×4·2) μ.

On tomato stem plug, culture 21 days old :—

0-septate 40% 4—13×2·5—4 (7×3·4) μ.
1-septate 20% 9—21×3—4 (15×3·5) μ.
3-septate 40% 20—33×3·5—4·5 (27×4·4) μ.

On hard potato agar, culture 21 days old :

0-septate 30% 4·5—13×2·5—4 (7·3×3·5) μ.
1-septate 20% 8—20×3—4·2 (14·5×3·5) μ.
3-septate 50% 20—31×3·5—4·5 (26×4·3) μ.

Group C.—The strains of this group differ from those of group A in that their 3-septate conidia are noticeably broader towards the apex, and that the curvature in that region is greater than that in the middle and basal thirds of their length. Blue-black sclerotia are almost always produced in cultures on potato tuber plugs, and vary greatly in size in different strains, some of which produce large nodulose sclerotia up to 3 mm. in diameter. The 3-septate conidia are slightly larger than those of the preceding groups, averaging 30 × 4.3 (25 — 38 × 4 — 4.5)μ.

Measurements of the conidia of some of the 27 strains belonging to this group on various media are as follows :—

On potato agar, culture 56 days old, conidia from a large cream sporodochium :

0-septate 10% 6—10×3—4·5 (8×3·4) μ.
1-septate 5% 10—25×3—4·5 (16×3·8) μ.
3-septate 85% 22—42×3·5—4·7 (31×4·4) μ.

On tomato stem plug, conidia from a sporodochium in a culture 42 days old :

0-septate 20%.
1-septate 5%.
3-septate 65% 20—39×3·5—4·8 (29×4·3) μ.
4-septate 10% 26—50×4—5 (35×4·6) μ.

On potato agar, conidia from pseudopionnotes in culture 21 days old :

0-septate 65% 7—15×3—4 (8·5×3·5) μ.
1-septate 20% 11—24×3·5—4·5 (16×3·7) μ.
3-septate 15% 23—35×3·5—4·5 (29×4·3) μ.

On hard potato agar, conidia from sporodochium in culture 21 days old :

3-septate 75% 22—37×3·5—4·5 (31×4·2) μ.

Group D.—Differs from group A in the absence of sclerotia, and from groups B and C in its longer conidia, which are not produced in macroscopic sporodochia. The 3-septate conidia of this group average 35 × 4.2 (30 — 38 × 3.9 — 4.5) μ.

Specimen measurements of some of the 8 strains belonging to this group are as follows :—

On potato agar, culture 21 days old :

0-septate 80% 6—15×3—4·2 (8·5×3·5) μ.
1-septate 15% 12—25×3—4·5 (17·5×3·8) μ.
3-septate 5% 20—38×3·6—4·5 (31×4·3) μ.

On potato tuber plug, culture 35 days old :

0-septate 85% 4·5—15×3—4·5 (7·8×3·6) μ.
1-septate 12% 13—28×3·5—4·5 (18×4) μ.
3-septate 3% 27—39×3·7—4·5 (34×4·3) μ.

On tomato stem plug, culture 42 days old :

3-septate 20% 20—40×3·8—4·5 (34×4·2) μ.

On potato agar, culture 21 days old :

3-septate 40% 27—45×3·8—4·5 (38×4·3) μ.

On potato agar, culture 21 days old :

3-septate 5% 20—38×3·6—4·5 (31×4·3) μ.

Group E.—Differs from group A in having longer conidia and om group B in that sclerotia are developed on potato tuber plugs. onidia 4-5-septate are much more common than in the strains assified in the foregoing groups. Typical microscopic sporodochia e developed. The conidia average for 3-septate 37 × 3·9μ; septate 40 × 4·2μ and 5-septate 44 × 4·5μ. This is a small roup of only 5 different strains.

Specimen measurements of the conidia of these strains on various media are ven below :

On potato agar, culture 21 days old, conidia from pseudopionnotes :

0-septate 15% 7—16×3·2—4·5 (10×3·5) μ.
1-septate 15% 12—26×3·5—4·5 (18×3·8) μ.
3-septate 50% 25—40×3·5—4·7 (37×3·9) μ.
4-septate 10% 36—48×4—5 (42×4·5) μ.
5-septate 10% 36—50×4—5 (44×4·5) μ.

On potato tuber plug, conidia from sporodochium in culture 28 days old :

3-septate 40% 30—40×3·5—4·5 (37×4) μ.
4-septate 20% 36—46×4—5 (40×4·4) μ.
5-septate 30% 38—52×4—5 (44×4·5) μ.

On tomato stem plug, culture 18 days old :

3-septate 80% 30—40×3·7—4·5 (35×4·3) μ.
4-septate 15% 35—47×4—5 (41×4·4) μ.

On potato agar, conidia from pseudopionnotes in culture 21 days old :

3-septate 15% 25—40×3·5—4·5 (33×4·4) μ.
4-septate 5% 35—48×3·5—5 (38×4·5) μ.

All the cultures belonging to the above groups were isolated from he affected vascular bundles of banana plants suffering from the vilt disease or " Panama Disease." In order to test the pathogenicity f these cultures a number of typical strains was selected from each roup, and inoculated into healthy banana plants. The latter were mall " suckers " taken from a district which has never suffered from he wilt disease, and were washed in 4 per cent. formalin and planted n tubs. In some of these tubs the soil had previously been terilised by passing through steam for one hour, as described by Brandes (2). The inoculations were made by growing the strains f *Fusarium* on a thin mush of banana tissue in large flasks, and mptying these in the soil around the roots of the suckers. Finally he cultures were covered with about 6 inches of soil. Control lants were kept, both in sterilised and in unsterilised soil. The noculated plants in sterilised soil succumbed to the disease after a eriod of from 4 to 8 months, the control plants remaining quite ealthy until dug up some months later for inspection. The inner issues of these control plants on examination proved to be quite ealthy, no sign of any disease being observed. The inoculated lants in the unsterilised soil remained healthy for a considerable ime after those in the sterilised soil had succumbed to the disease, ut finally after a period of 15 to 18 months some of them showed ypical symptoms of the disease. The remaining inoculated plants ere dug up and the rhizomes were examined internally for signs

of the disease. In every case the inoculated plants showed affection of the vascular system by the *Fusarium*, the extent varying from a slight discoloration of a few bundles on one side of the rhizome, to almost complete infection, extending into the leaf bases forming the "trunk" of the plants. On account of the prolonged shortage of water experienced by the plants, commencing about 6 months after planting, the progress of the disease was apparently much delayed; the inoculated plants remaining after this time grew extremely slowly, and suffered considerably from lack of water. This is in accordance with field experience with the wilt disease, as during long periods of drought the progress of the disease is much slower than in rainy weather. There is no doubt, in the opinion of the writer, that had it been possible to allow the inoculated plants to remain longer, or to give them a more adequate water supply, they would have succumbed to the disease in exactly the same way as those planted in the sterilised soil. The symptoms shown by these plants inoculated and grown in ordinary unsterilised soil were typical of the earliest stages in attack of the banana plant by the disease, as observed in the field. The only difference between these two sets of inoculations in sterilised and unsterilised soil was that the progress of the disease in sterilised soil was much more rapid than in the unsterilised soil. Whether this is due to differences in the physical state of the soil when sterilised, or due to changes in the acidity, or whether it is due to the removal of other normal fungus and bacterial inhabitants of the soil by the process of sterilisation, the writer is unable to say. No differences were observed in the effect of the various strains of *Fusarium* used for the inoculations on the plants. All appeared to be equally parasitic in character, thus indicating that they must be considered biologically as a single species. This uniformity of the results of inoculation experiments with the members of the groups A to E above indicates that they must all be included under *Fusarium cubense*, E.F.Sm., which is defined as being the cause of the banana wilt disease. All the above strains were originally isolated from the vascular systems of diseased banana plants, and all of them used in the inoculation experiments on the banana gave positive results, causing the symptoms of the disease, the only difference found being in the time required by the various strains for complete infection of the vascular system of the inoculated plants. Under more suitable weather conditions all the strains would doubtless have given rise to the typical appearance of the disease on the inoculated plants very much sooner.

With regard to the above classification of these strains into the groups A to E, it must be mentioned that the boundaries of these groups are not sharply delimited, but rather that each represents a type and that in each group there are included strains that diverge from this type to a greater or less extent. Especially is this the case in those groups separated on a basis of the size of the conidia, as some strains were found to vary within considerable limits in the

average size of the conidia, even when grown for successive generations on the same medium.

In a recent paper by Gäumann (4) on the vascular diseases of *Musa* spp. in the Dutch East Indies, it is stated that the disease there prevalent, which corresponds closely in its symptoms with the true " Panama Disease " or " Banana Wilt " of Central America and the West Indies, is caused, not by a *Fusarium*, but by a bacterium. Gäumann expresses the opinion that the *Fusarium cubense* considered by the workers on the Panama Disease in the West Indies, etc., to be the cause of the disease, has not been proved such, and he compares it with the strains of *Fusarium* which he finds present in the vascular systems of plants affected with the similar disease which he describes in Java. He considers the species he finds present in this situation to be merely secondary invaders of the vascular systems of plants after attack by the primary bacterium. During the present series of isolations and inoculations the writer has found *Fusarium cubense* to be the sole invader of the vascular bundles which show the first stage in the progressive discoloration associated with the disease, and that bacteria are often completely absent from such bundles, only making their appearance some time later, when the bundles are considerably darker in colour. Portions of the vascular bundles of the leafbases of affected plants were cut out under sterile conditions, showing only the earliest stage in the discoloration of the tissues, and were plated out on potato agar in the usual way. Others were placed in tubes of sterile nutrient solutions, and incubated. In no case was any one bacterium found to be constant in its occurrence. In one series of isolations 30 tubes of nutrient broth were thus inoculated, and only 6 showed the presence of bacteria after a week's growth. These bacteria were isolated in pure culture, but none were found to correspond with that described by Gäumann (*Pseudomonas Musae*, Gäum.) as the cause of the wilt disease of the banana and other species of *Musa* in Java. All bacteria isolated by the writer from the vascular systems of bananas in Jamaica proved to be common saprophytes. None of those inoculated into the banana proved at all capable of invading healthy tissues and causing any symptoms similar to those of the wilt disease. Additional evidence against Gäumann's views on the true " Panama Disease " is afforded by the results of the many inoculation experiments which have been carried out by so many independent workers in the West Indies and Central America. In every case *Fusarium cubense* has proved capable of causing typical wilt symptoms when inoculated into healthy banana plants.

In addition to the 103 strains above described as isolated from the vascular tissues of banana plants suffering from the " Panama Disease ", 212 other strains belonging to the section *Elegans* were isolated from other sources. Many of these were isolated from

specimens of soil, "banana trash," and other plant debris. These strains were studied side by side with those described above, and classified into groups in a similar way. An exhaustive series of inoculation experiments was carried out with many of these strains on banana plants, using the same methods as those described above. In no case were any symptoms of wilt disease observed on the inoculated plants, and none of these strains appears to be at all pathogenic to the banana. This non-pathogenicity of these strains to the banana represents a constant and definite difference between them and those strains isolated from affected banana plants.

Group F.—The strains of this group proved to be morphologically identical with those of the group A above. No constant difference could be observed between the cultures of the two groups in spite of the most careful observation.

This group represents a very large series of different strains, 95 in number, isolated from many different sources. It is widely distributed throughout Jamaica, some of the strains being isolated as saprophytes in soil and on plant debris of all kinds, while others were isolated from the roots of various plants showing typical symptoms of wilt disease. Inoculations have not yet been carried out with these strains upon the hosts from which they were isolated, but it is possible that some of them may prove to be capable of attacking these hosts under certain climatic conditions.

The measurements of the conidia given for members of the Group A above apply equally well to the strains of this group.

Group G.—The strains of this group could not be distinguished from those of group B above in artificial cultures, but differed from them in not being at all pathogenic to the banana. This group contained only 12 different strains, all of which were isolated from soil specimens.

Group H.—This group of 72 different isolations proved identical in culture in the laboratory with the strains of group C above, but none of those used in inoculation experiments on banana proved capable of causing any symptoms of wilting. The members of this group are also common saprophytes in the soil, especially in the dryer parts of Jamaica, where this group often predominates largely in the *Fusarium* flora of the soil.

Group J.—This group of 23 different isolations proved identical in culture with the strains of group D above. All were isolated from soil specimens.

Group K.—This group of 13 isolations was morphologically similar to the groups C and H above, but the conidia are noticeably smaller than those of the strains belonging to these two groups, and are slightly broader towards the apex than in the other part of their length. The curvature of the conidia is greater towards the apex, and the average size for 3-septate conidia is $25 \times 4\mu$. None of these strains appears to be at all pathogenic to the banana. Most of them were isolated from soil specimens, but 6 were isolated from

specimens of dead and dying plants of sugar cane, being found present in the tissues of the roots.

Measurements of 3-septate conidia :

On potato tuber plug, culture 21 days old :

3-septate rare 18—26×3·5—4·5 (23×4) μ.

On tomato stem plug, culture 28 days old :

3-septate 40% 18—34×3—4·5 (26×4) μ.

On potato agar, culture 56 days old :

3-septate 20% 22—34×3—4·5 (26×4·2) μ.

On tomato stem plug, culture 42 days old :

3-septate 50% 20—30×4·2 (26×4·2) μ.

As was noted above, this detailed work on this section of the genus was originally undertaken in order to determine whether or not the organism causing the Panama Disease of the banana (*F. cubense* Smith, emend. Brandes) could be found present in soils other than those in the immediate vicinity of the roots of diseased banana plants. At an early stage in the investigation of this point it became necessary to evolve a method of differentiating this species from other closely related forms.

From the present work it becomes evident that the only possible test for this organism is that of inoculation into healthy banana plants. In other words, "*Fusarium cubense*" is a purely "biological" species, as distinct from the purely "morphological" species such as "*F. oxysporum*," etc., and cannot be diagnosed from its morphological characters, as shown in artificial culture.

During the course of his work on this problem of determining whether or not "*F. cubense*" is present in virgin soils, or in soils in districts where the bananas have not been affected with the wilt disease, the writer tested out some 50 different strains belonging to the groups F to K above, by inoculation into healthy banana plants, both in the manner described by Brandes (2) and also by direct inoculation into the tissues of the rhizome. In none of these experiments did the bananas show any symptom of the wilt disease, or even any local lesions on the roots or rhizomes. Consequently all the evidence from these trials tends to indicate that the "*Fusarium cubense*" of the Panama Disease is not present in any soil where the bananas are not attacked by the disease. This evidence is supported by the field experience of the Department of Agriculture in Jamaica, with their control measures devised for use against the disease, which are based upon the fundamental assumption that the disease is not present in "healthy" banana soils. Were this not the case it is probable that the history of the disease in Jamaica would have proved greatly different from what it has been up to the present. Although there is little doubt that climatic and other factors have a great influence upon the incidence and rate of spread of the disease, the history of the disease in Jamaica has been so vastly different from that in Central America that undoubtedly the energetic measures adopted here for the control of the disease have had a

great influence towards retarding the rate of spread. There is little question of any great difference in the actual virulence of the parasite having to be taken into account, as it has proved itself on several occasions capable of causing damage on a similar scale here in Jamaica to that in Central America.

The Classification of Section Elegans.

Wollenweber and his various co-workers have elaborated a classification of the whole genus *Fusarium* based on the morphological characters of the fungi as determined in artificial culture. In the case of the present section, however, the classification is much complicated by the fact that a large number of the fungi of this group are known to be pathogenic, causing wilt diseases of various plants. These pathogens are very similar to each other when grown in culture, and also to many of the saprophytic forms belonging to this same group. The search for suitable diagnoses of each of these pathogenic fungi has led to a very detailed examination of their morphological characters, with the result that the present diagnoses of the members of this section are based on extremely minute differences in their microscopic characters. The present position is still further complicated by the considerable range of variation shown by the different strains of each "species," and even by a single strain when grown repeatedly on the same medium and under apparently identical conditions.

Taking for example the "species" *F. cubense* E.F.Sm. and its variety *inodoratum* Brandes, these fungi are diagnosed as pathogenic to the banana (*Musa sapientum*), causing the Wilt or "Panama" Disease. All the fungi in the groups A to E above are included in this general biological diagnosis, yet in their morphological characters they show considerable divergence, even in some of the characters upon which Wollenweber has based the main division of the section into the two sub-sections *Orthoceras* and *Oxysporum*. Adopting his classification some of these strains of "*F. cubense*" should be placed in the former of these subsections, and others under various species of the latter.

It appears to the writer that the system of diagnosing "species" in the present section of this genus, by the selection of a morphological type as a basis for the erection of each species, is unsatisfactory, as it does not take into account the range of variation shown in such a "biological" species or unit as is formed by those strains which are capable of causing banana wilt. If, however, we endeavour to include all such strains in a single morphological species, by greatly widening the morphological diagnosis, we are confronted with another great difficulty, as we are then forced to include other strains having the same morphological characters, but distinct biologically as being non-pathogenic to the banana, and possibly either saprophytic in habit, or even pathogenic to other plants.

The most recent diagnosis of *F. cubense* is that given by Reinking and Wollenweber (13, p. 89), as follows :

"Macroconidia gradually attenuate toward the apex, end cell constricted, sickle-shaped, pedicellate, broader in the middle and generally more distinctly curved toward the apex, 3(4–5)-septate, typically 3-septate, 35×4·0 (17—51×3·0—4·5) μ ; also 2–5-septate, 2- and 4-septate being more common, 5-septate rare ; 4-septate 32—53×3·5—4·5 μ ; 5-septate 40—57×3·5—4·75 μ; sporodochia and pionnotes present ; microconidia ovoid or elongate, 0–1-septate, mostly 0-septate, 5—17×2·25—4·5 μ ; 1-septate 13—26×3·25—4·0 μ ; 2-septate 18—28×3·5—4·5 μ ; frequently produced in abundance with absence of macroconidia on young cultures ; chlamydospores abundant in old cultures, in mycelium (intercalary and terminal) in conidia, 0–1-septate 4–9 (–12) μ diameter, often catenulate, 0–septate, 4·5—9×4·0—6·25 μ ; 1–septate 9—12×4·5—7·25 μ. Strong benzolic odour on rice."

The same authors note that two types of spores may be present, a long and narrow form from pionnotes, and a short and wide form from mycelium and older sporodochia, the latter being the more general type found, though for purposes of diagnosis they have selected the former type of spore.

In the paper quoted Reinking and Wollenweber distinguish those forms which they include under *F. oxysporum* var. *nicotianae* from *F. cubense* by such minor characters as the lack of a benzolic odour in rice cultures of the former, the more feeble development of sporodochia and pionnotes and of sclerotia in cultures of the latter, and by the absence of any evidence of pathogenicity to the banana in the case of the former. The production of a benzolic odour on rice is not always shown by cultures of *F. cubense*, such cultures being typical of the variety *inodoratum*, between which and *F. oxysporum* var. *nicotianae* the only difference is that of pathogenicity to the banana. Neither is the production of such an odour on rice limited to cultures pathogenic to the banana, as some strains isolated by the present writer, which showed no evidence of such pathogenic qualities, developed a strong odour when grown on rice.

At the same time these authors produce no evidence for including these strains under *F. oxysporum* var. *nicotianae*, which was originally diagnosed by Johnson as being the cause of the wilt disease of tobacco in the U.S.A. It appears to the present author that these strains might have been included under *F. cubense* with as much reason as under *F. oxysporum* var. *nicotianae*. Reinking and Wollenweber state that " it is evident that inoculation experiments are necessary for an accurate determination of the wilt-producing organisms " and that such a similarity as that indicated above shows " that there may be wild saprophytic forms of known pathogenic species." (13, p. 90).

These statements indicate that the authors referred to admit that it is impossible to distinguish between such a parasitic form as the organism producing a wilt of the banana and some of the closely related saprophytic forms. In consequence the morphological diagnoses of the various wilt-producing forms in this section are valueless as a method of separating them, and may be even somewhat misleading.

It appears to the writer that our present classification of this section of the genus, as elaborated by Wollenweber and his colleagues, serves merely as a means of separating into morphological "species" the saprophytic forms of the section, and cannot be applied to the parasitic strains, which cause vascular diseases of a large number of different plants. This separation of the saprophytic forms into such "morphological species" appears to be superfluous, and they might all be included under *F. oxysporum*, thereby much simplifying the nomenclature of this genus.

In the case of the pathogenic forms we are faced by another great deficiency from a classificatory standpoint, namely, the lack of any adequate work on the host range of each of these forms. It is possible that some of these forms may be cross-inoculable from one host to another, and work on this point is urgently needed. Also we have little knowledge at present of the conditions under which these parasitic and "semi-parasitic" forms are able to attack their various host plants.

In view of the above considerations the present author prefers to class all the organisms he has isolated belonging to this section of the genus as strains of *F. oxysporum*, the various strains showing among themselves considerable divergence both in morphological and physiological (biological) characters.

At the same time, in order to compare the present work with that of Wollenweber, a list is given below of the various "species" which are recognised by the latter, and which have been found by the writer in Jamaica:

19. **F. oxysporum** *Schlecht.*
20. **F. oxysporum** var. **nicotianae** (as defined by Reinking & Wollenweber, 13, p. 86).
21. **F. oxysporum** var. **nicotianae** *Johns.* (causing wilt of *Nicotiana tabacum*—rare).
22. **F. orthoceras** *App. & Wr.* (identified for me through the courtesy of Drs. Reinking & Wollenweber).
23. **F. orthoceras** var. **longius** (*Sherb.*) *Wr.*
24. **F. asclerotium** (*Sherb.*) *Wr.*
25. **F. lycopersici** (*Sacc.*) *Wr.* (causing wilt of *Solanum lycopersicum*—rare).
26. **F. cubense** *E. F. Sm.*
27. **F. cubense** var. **inodoratum** *Brandes.*

F. cubense and its variety *inodoratum* cause the Wilt or Panama Disease of the banana (*Musa sapientum*) and the plantain (*Musa paradisiaca*) and are found in most of the banana growing areas in Jamaica.

28. F. **aurantiacum** (*Lk.*) *Sacc. emend. Wr.* (found in soil and on the roots of diseased *Saccharum officinarum*).

The fungi of this group are common organisms in the soil in Jamaica, and from almost every soil isolation made organisms

satisfying one or other of the diagnoses of the "species" enumerated above could be isolated. These fungi are also common on all decaying and diseased vegetable matter, usually growing as secondary saprophytes, following on the pathogenic fungi causing the disease in the case of diseased plants. Several have been found as secondary invaders in the vascular tissues of the "bulb" (rhizome) of bananas affected with wilt disease, following on the *Fusarium cubense* causing the disease. The latter can usually be isolated in pure culture from those parts of the vascular system of affected plants which show the earliest stages in the progressive discoloration of the vascular bundles due to the disease. At later stages in the discoloration other organisms are found present, usually other members of this same group, section Elegans, of *Fusarium*. Subsequently other Fusaria enter the diseased bundles as well as members of other genera.

The other parasitic organisms mentioned above, namely, *F. oxysporum* var. *nicotianae* (sensu stricto) and *F. lycopersici* are only occasionally met with in Jamaica.

XIV.—Section **Martiella** Wr.

Wollenweber, Phytopathology 3 : 30. 1913. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ber. d. Deut. Bot. Ges. 35 : 738. 1917. Wollenweber, Sherbakoff et al. Journ. Agr. Res. 30 : 833, 1925.

This section is thus diagnosed by Wollenweber :

"Macroconidia dorsiventral, spindle to sickle-shaped, apex more or less rounded, base more or less subpedicellate ; microconidia oval to oblong, mostly 0-septate ; sporodochia and pionnotes present, white, pale ochre or golden ; stroma greenish to blue or almost black ; chlamydospores terminal, intercalary, 1-celled, 2-celled, catenulate or in heaps. Imperfect stage of the group Hypocreales, section Pseudomartiella." (13, p. 102.)

The strains belonging to this section are easy to recognise as such, but the identification of the various species and varieties within the group is a matter of extreme difficulty. The size of the spores and the number of septa vary considerably, even in a single strain of the group ; and these are the characters upon which the separation into species is chiefly based.

Wollenweber and Sherbakoff have made varieties and even species which could have been avoided had they allowed their species to become slightly more comprehensive, and the characters on which these varieties are separated are, in the experience of the writer, not sufficiently stable. The species erected by these workers merge gradually one into another through a large series of forms which are more or less intermediates, and which have, in some cases, been considered as distinct varieties of the various species.

29. **Fusarium solani** (*Mart. pr. p.*) *App. & Wr.* var. **minus** *Wr.*

Wollenweber, Ann. Myc. 15 : 55. 1917.

Wollenweber & Reinking diagnose this as follows :

"Macroconidia 3-septate, 27—33 × 4·25—5·0 μ ; chlamydospores terminal, intercalary, single, catenulate or in heaps, sometimes rugulose, 7–8-μ diam. For other characters see *F. solani*." (13, p. 102.)

This has been found in Jamaica by the writer in soil and on the roots of diseased sugarcane (*Saccharum officinarum*) together with *F. aurantiacum*. It is quite common as a saprophyte on decaying banana material.

The cultures of this fungus were identified for me through the courtesy of Drs. Reinking and Wollenweber.

30. **Fusarium solani** (*Mart. pr. p.*) *App. & Wr.*

Appel & Wollenweber, Arb. K. Biol. Anst. Land.-u. Forstw. 8 : 65. 1910. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Carpenter, Journ. Agr. Res. 5 : 204. 1915. Wollenweber, Ann. Myc. 15 : 25. 1917.

" Macroconidia scattered in mycelium or in false heads, in sporodochia or pionnotes, spindle shaped or slightly curved, typically broader in upper half of length, rounded to slightly constricted apex, slightly pedicellate or not at all, 1–5-septate, typically 3-septate 30—40 × 5·0—6·0 (25—45 × 4·5—6·5) μ fewer 2– and 4-septate; 1-septate 15 × 4·0 μ; 5-septate 42—48 × 6 μ; conidial mass brownish white, **in older cultures light brown and sometimes** with green or greenish blue; plectenchymata sometimes greenish blue in older cultures and white or brownish white in younger; chlamydospores terminal intercalary, in mycelium and conidia, 1-celled, spherical or pear-shaped, 8·5 × 8 μ, 2-celled 12 × 7·75μ, less seldom in chains or heaps, smooth, sometimes definitely rugose.

" *F. Solani* has a broad type of conidia." (13, p. 106.)

In Jamaica the present author has isolated this fungus from soil, where it appears to be fairly common in occurrence, and also from banana debris.

31. **Fusarium Martii** *App. & Wr.* var. **minus** *Sherb.*

Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ann. Myc. 15 : 26. 1917.

Sherbakoff describes this variety as follows :

" Differs from *F. Martii* and *F. Martii* var. *viride* by having smaller, 3-septate conidia 36·7 × 4·8 (30—44 × 4·55—5·1) μ, usually prominent development of plectenchymic, wart-like stromata, and fewer and larger sporodochia. Colour of substratum, on Potato agar rich in glucose, from light gray to drab and dark olive-buff, with a fuscous-coloured spot at the point of inoculation."

This variety is the commonest member of this section to be found in Jamaica, and is present in most soils, especially in the wetter districts. It is common on all kinds of vegetable debris.

Several of the writer's cultures differed from the above diagnosis in that no sclerotia were developed in artificial culture, but in other respects they satisfied Sherbakoff's diagnosis, so that they have been included under this variety.

32. **Fusarium Martii** *App. & Wr.*

Appel & Wollenweber, Arb. K. Biol. Anst. Land.-u. Forstw. 8 : 78. 1910. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Wollenweber, Ann. Myc. 15 : 25. 1917.

Wollenweber gives the following description :

" Conidia scattered in the mycelium, in false heads, or in sporodochia or pionnotes, normal conidia much longer than in *F. solani*, straight in the middle or only slightly curved, curve more pronounced at the ends, especially the apex, dorsal and ventral sides often almost parallel except at the apex ;

3–4-septate, 44—60×4·75—5·5 (39—70×4·5—6·0) μ, less frequently 5-septate 54—62×4·5—5·75 μ; 6-septate up to 82×5·0 μ, colour of conidial masses between brownish white and light brown, and through the mingling of the greenish blue plectenchymata, the pionnotes may assume a gray, bluish gray or brown to black colour; plectenchymatic stroma little or lacking; chlamydospores as in *F. solani*."

Found in Jamaica on tubers of *Solanum tuberosum* and on the surface of a partially burnt banana rhizome, and also very occasionally in soil.

33. **Fusarium eumartii** *Carp.*

Carpenter Journ. Agr. Research 5: 204. 1915.

Carpenter's description of this species is as follows:

" Agrees with Appel & Wollenweber's diagnosis of *F. Martii* except in certain details of the conidia. The latter are higher septate and have a somewhat larger average size. Normally 4–6-septate, averaging 54 to 75×5·5 to 6·6 μ (limits: 50—80×5—7·2 μ) . . . . .

The conidial colour fluctuates between brownish white and bright brown; by infiltration of the greenish blue plectenchymatic pigment the conidial mass becomes gray, blue-green to brown and a dark mixed colour. The plectenchymatic stroma is weakly developed or lacking, and therefore the pionnotes lies naked on the substratum. The chlamydospores, 7–10 μ in diameter, agree with those in other species of this section."

The present writer has only once isolated a strain belonging here, from a leafspot on *Solanum torvum*, where it was probably a secondary saprophyte following on the *Cercospora* causing the spot. It agrees closely with the above description, and is easily distinguishable from the other species of this section found here, by the higher septation and larger size of the conidia.

34. **Fusarium radicicola** *Wr.*

Wollenweber, Journ. Agric. Res. 2: 257. 1914. Sherbakoff, Cornell Agr. Exp. Sta. Mem. 6. 1915. Carpenter, Journ. Agric. Res. 5: 205. 1915. Wollenweber, Ann. Myc. 15: 26. 1917.

Reinking & Wollenweber thus describe this species:

" Conidia comparatively slender, spindle to sickle-shaped, slightly constricted at both ends, apiculate to subpedicellate at the base, normally 3-septate, may occur scattered in sporodochia or pionnotes, averaging 30—45×3·75—5μ; 25% of the total number may be 4-septate; 5% may be 5-septate and average 40—59×4·0—5·25 μ; chlamydospores 7—10 μ, agree with those of other species of the section Martiella." (13, p. 122.)

In Jamaica this species has been isolated from soil, and Carpenter (3, p. 206) mentions that he had received a culture of this species from Mr. S. F. Ashby, isolated from *Musa sapientum* in Jamaica.

35. **Fusarium javanicum** *Koord.*

Koorders, Verh. Kon. Akad. Wetensch. Amsterdam II, 13: 247. 1907. Saccardo, Syll. Fung. 22: 1482. 1913. Wollenweber Ann. Myc. 15: 26, 1917. Ber. d. Deut. Bot. Ges. 35: 742. 1917. Reinking & Wollenweber, Fusaria in Relation to Banana Cultivations. United Fruit Co. Boston. 1925.

" Conidia scattered, in sporodochia and pionnotes, 3–4–5-septate 43—54×4·5—5·0 μ; 5-septate 49—54×4·5—5·4 μ; base subpedicellate, apex cell longer and less curved and more pointed than *F. striatum*, sometimes acute,

approaching sickle-shaped; chlamydospores 1–2-celled, terminal and intercalary; mycelium white to cartridge buff; conidial masses cream-buff, olive-ochre, or at times greenish." (13, p. 128.)

Isolated only once from a specimen of soil from Buff Bay, Portland.

Although the writer has separated the strains of this section into the above species, he is of opinion that future workers on this genus will modify the present classification and unite several of the "species" recognised by Wollenweber into a single more comprehensive species, taking into consideration the many forms which are more or less intermediate in characters between the types which are at present elevated into "species" and "varieties." Most of the forms belonging to this section of the genus are either of saprophytic habit or are wound parasites, and in the writer's opinion the present classification merely adds to the difficulty of identifying these organisms, by unnecessarily multiplying the number of species in the group. I have not studied the organisms of this section in the same detail as in the case of those isolations belonging to the section Elegans, and in the present instance I have followed the classification of Wollenweber and his co-workers as far as possible.

Hypocreales.

36. **Hypomyces ipomoeae** (*Hals.*) *Wr.*

Wollenweber, Phytopathology 3 : 34. 1913; Journ. Agr. Res. 2 : 270. 1914; Ann. Myc. 15 : 8. 1917; Ang. Bot. Zeit. Erf. Nutzpfl. 6 : 300. 1924.

Reinking and Wollenweber give the following diagnosis :

"Perithecial stage : Perithecia scattered or gregarious, free on the surface of the host, as well as embedded in mycelium or on a distinct plectenchymatic stroma, ovoid, subconical, sub-flask-shaped; averaging 225—375 × 175—300 μ. Peridium strongly verrucose, owing to protuberance-like projections of cell groups, red to reddish-brown, except the almost colourless conical beak. A few paraphyses line the inner wall of the throat from the ascus ball to the ostiolum. Asci up to over 100 in each perithecium, intermixed with a few more celluled paraphyses. Ascospores 8, in one row or irregularly in 2 rows, 2–celled ovoid to ellipsoidal, with wrinkled exospore, in mass brownish white; 1-septate, average size 10—13 × 4·5—6·0 μ, under moist over-ripe conditions slightly constricted at septum.

Conidial stage : Conidia scattered in sporodochia or pionnotes of nearly cylindrical shape at the septal zone, slightly pointed and curved at the ends, base pedicellate without a distinct heel. Conidia 3–5-septate; 3-septate 30—45 × 3·75—5·0 μ; 5-septate 45—70 × 4·25—5·5 μ. Of the total number 30% may be 6-septate, 10% may be 7-septate with an average size up to 70 × 6 μ. In young moist and hunger stages unicellular conidia occur, averaging 6—12 × 3·0—4·75 μ. Colour of conidial masses brownish white, occasionally impregnated with blue, a mycelium colour, especially found in the plectenchyma. Conidiophores verticillately branched. Chlamydospores globose or ellipsoidal, terminal and intercalated, mostly unicellular and scattered, average diameter 7—10 μ." (13, p. 136.)

In Jamaica this form has been isolated from soil, from a knot on *Citrus* twigs caused by *Sphaeropsis tumefaciens*, where the present fungus was apparently a secondary invader of the tissues, and from the cut surface of a banana rhizome at Catadupa, which had been exposed under damp conditions for a few days.

During the course of the present work the writer has been struck by the defects of the present system of classification of this genus, as given by previous workers. Up to the present it seems that the conception of a single species in this group of fungi has been kept too rigid, and does not allow a sufficient range of variability within the species. Especially is this the case in the sections *Elegans* and *Martiella*. The organisms of the former include many parasites of crop plants, and the workers on this group have endeavoured by a minutely detailed examination of the characters of these fungi grown in culture under as far as possible closely specified conditions, to separate these organisms from each other on morphological characters, which necessarily show extremely minute differences, if indeed, any at all, between the various strains of the group. Not only are these differences between the so-called "species" so minute, but at the same time each organism shows such a great range of variability in its morphological characters that the differences used to separate the various "species" are almost negligible by comparison. This point has been discussed above in the remarks on the section *Elegans*, and in the present work all strains of this group are considered as belonging to a single species, which shows a large range of variation, both in morphological and in biological characters. These remarks apply with almost equal force to the section *Martiella*.

It appears to me that much would be gained, and much labour spared, were the various sections of the genus which have been erected by Wollenweber and his colleagues to be considered as species rather than sections of the genus, and then the various species at present included in these sections could be regarded as forms of these large species which show a slight variation from a central type. Many of the present "species" in the section *Elegans* have been erected on more or less purely pathological characters, and morphologically are included in other species of the same group. The above suggestion would remedy this state of affairs, and seems to be the only solution to the present difficulty. This need for a less rigid morphological basis for the erection of species is not confined to this genus, but is felt in many other of the larger genera, especially in the *Hyphomycetes*, and in the *Fungi Imperfecti* generally. It was shown for the genus *Cladosporium* by Brooks and the writer (Trans. Brit. Myc. Soc. 8 : 113., 1923).

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XXXV.—NEW POLYSTACHYAS. F. Kraenzlin.

The monograph of *Polystachya* published in *Fedde Repert.* Beiheft xxxix had already been sent to the printer when the material described in this paper arrived. It was impossible to recall the manuscript, but on the other hand it would have been even more inconvenient to wait until the present paper had been published. I resolved therefore to publish these new species as a separate paper in the *Kew Bulletin*. The names of the sections written in square brackets are the same as those I have proposed in the Monograph, while the notes concerning the closer affinities will make it easy to bring the new species into their proper places in the system.

Polystachya subcorymbosa *Kraenzl.* n. sp., [*Caulescentes*]; differt ab omnibus speciebus adhuc descriptis inflorescentia apice corymbosa paulum elongata. Recedit a ceteris *Caulescentibus* floribus erectis longe pedicellatis. Nulli ceterum affinior.

Caulis gracilis, pars quae praestat 16 cm. longa, tenuis; internodia 7 cm. longa, vaginis griseis 3.5 cm. longis vestita. *Folia* linearia, longe acuminata, ad 11 cm. longa, 6 mm. lata, sensim decrescentia, supremum 3.5 cm. longa. *Scapus* teres vel vix compressus, glaber vel sparsissime puberulus; inflorescentia simplex,

subcorymbosa, floribus supremis subumbellatis aequialte congestis, ovaria longe (8–10 mm.) pedicellata; bracteae ovato-triangulae, acuminatae, 2 mm. longae. *Sepalum dorsale* late oblongum, acutum, 3 mm. longum; sepala lateralia ad 6 mm. longa, late oblonga, acuta, mentum galeatum, obtusum, quam pars antica sublongius formantia. *Petala* obovata, obtusa. *Labelli* lobi laterales ligulati, obtusi, divergentes; lobus intermedius cuneatim dilatatus, antice retusus vel subbilobulus, pulvinar maximum ab ipsa basi ad apicem lobi intermedii dense villosum, exceptis margine et lobis lateralibus calvis. *Gynostemium* generis perbreve. *Flores* luteo-albi.

Country of origin unknown. Cultivated at the Royal Botanic Gardens, Kew.

A species of a very slender caulescent habit with distant very narrow leaves showing no special feature. The short few-flowered inflorescence is nearly an umbel, the flowers which have rather long nearly equal pedicels being crowded in a singular manner that I have never seen in any of the numerous specimens I have previously examined. The flowers are rather small, of no beauty at all, the only character of any interest being the enormous cushion of velvety hairs beginning at the base of the lip and extending to the top of it. It is to be regretted that there is no information stating by whom and from where the specimen was sent to the Royal Gardens.

Polystachya graminoides *Kraenzl.* n. sp., [*Caulescentes*]; differt a *P. oligophylla* Schlechter cui certe proxima foliis anguste linearibus multo longioribus, panicula longiore pluriramosa, mento vel galea sepalorum lateralium brevissimo rotundato neque in pileum producto, lobo labelli intermedio oblongo obtuso, disco omnino glabro.

Planta elata, paucifoliata, 40–45 cm. alta (pars basilaris deest); internodia 3–6.5 cm. longa. *Foliorum* vaginae arctae; laminae gramineae, 10–25 cm. longae, longe acuminatae, 5–8 mm. latae, satis durae, tenacissimae, supremae paniculam superantes, summum caulem versus in vaginas 2 vel 3 angustas, acuminatas, decrescentes; vagina suprema basin paniculae amplectens. *Panicula* ad 8 cm. longa, rami 4–6, per totam longitudinem dense floriferi, tota panicula igitur multiflora; flores parvi, subglobosi, extus glabri; bracteae circiter 1 mm. longae, triangulae, acutae. *Sepalum dorsale* late triangulo-ovatum, acutum, concavum, circiter 1 mm. longum; sepala lateralia latissime ovata, profunde concava, obtuse acutata, vix mentum subglobosum formantia, 1.5 mm. longa, basi 1.5 mm. lata, omnia (sicca scil.) clathrata. *Petala* subbreviora, obtusa, tenerrima. *Labellum* a latere visum sigmoideum in florem reflexum; lobi laterales late lineares, obtusi, intermedio longiores; lobus intermedius latior, brevior, cum lineis 3 paulo crassioribus, discus ceterum glaber et ecallosus, totum labellum 1.5 mm. longum, inter lobos laterales 1.5 mm. latum. *Capsulae* mihi non visae.—Fl. Octobri.

Tropical Africa. Uganda: Mukono, common in the Victoria Nyanza region, *T. D. Maitland*.

From its flowers only, the species would be placed among the *Callunifloraе*, but in its habit, leaves and inflorescence it is totally different. The nearest species is certainly *P. oligophylla* Schlechter, while from the structure of the lip *P. stauroglossa* Kraenzl. is also closely allied. On account of the total lack of hairs on the disk of the lip the flowers of this species are certainly less attractive to insects and thus the total absence of capsules is explicable.

Polystachya candida *Kraenzl.* n. sp., [*Eupolystachyae*]; differt a *P. obanensi* Rendle pseudobulbis contiguis curvulis, spica densiore, labello etiam latiore, callo mediano crassissimo.

Rhizoma repens (ascendens). *Pseudobulbi* curvuli, pauciarticulati, in collum brevem terminati, ad 3.5 cm. alti, 2 vel 3 internodiis compositi, basi (sicci scil.) 5-6 mm. diametro. *Folia* non praestant. *Scapi* summitas tantum adest cum inflorescentiis 2, altera racemosa, altera paniculata, pauciramosa, scapus ceterum glaber, superne (rhachis) sparsissime setulosus; flores circiter 20, albi, sicci tamen nigri; bracteae triangulae, acuminatae, ad 2 mm. longae vel vix longiores; pedicelli cum ovariis (triquetris?) 6–7 mm. longi. *Sepalum dorsale* ovatum, obtuse acutatum, profunde concavum, 4 mm. longum, basi 3 mm. latum, satis difficile explanandum; sepala lateralia late triangula, valde concava, breviter acutata, mentum ample saccatum subduplex efficientia, ad 5 mm. longa, 3 mm. lata; omnia 3 textura satis firma, dense reticulata. *Petala* lineari-spathulata, breviter apiculata, multo teneriora, vix ultra 2 mm. longa. *Labellum* toto ambitu rhombeum; lobi laterales vix sejuncti (si mavis latissime obtrianguli) antice retusi, et lobus intermedius triangulus valde obtuse acutatus, apex labelli obtusus, totum labellum 3 mm. longum, expansum 4 mm. latum, callus in disco ceterum glabro crassissimus a basi ad 1/3 totius longitudinis decurrens.

Probably a native of eastern tropical Africa; cultivated in England.

Of this species there are in the Kew Herbarium only two specimens which flowered in the houses of the Royal Botanic Gardens in the years 1906 and 1907, and were dried presumably by the late Mr. R. A. Rolfe. There is no information about the country of origin. The spikes and especially the lip of the flowers resemble those of *P. obanensis* Rendle. The flowers are said to have been white.

Polystachya lepidantha *Kraenzl.* n. sp., [*Eupolystachyae* II. *Dolichophyllae*.]; differt a *P. Buchanani* Rolfe (et ab omnibus aliis) floribus intus ubique lepidotis, labelli lobis lateralibus latioribus obtusis ceterum illi speciei valde affinis.

Specimen unicum mancum, adest folium 1 apice refractum et scapus. *Folium* e basi vaginante oblongum, pars quae praestat ad 20 cm. longa (totum certe ad 25 cm. longum), 4.8 cm. latum.

Scapi pars quae praestat 25 cm. longa, stricta, apice nutans, vaginis griseo-albis dense imbricantibus apicem usque vestita; racemuli ad 7, breves, nutantes, densiflori e vaginis erumpentes, ad 2 cm. longi; rhachis brevi-setosa; bracteae triangulae, ovaria aequantes, acuminatae, circiter 2 mm. longae; ovaria glabra. *Sepalum dorsale* ovatum, acutum, concavum, 3 mm. longum, basi 1.5 mm. latum; sepala lateralia triangula, leviter curvata, acuta, mentum parti anticae aequilongum obtusum formantia, 5.5 mm. longa, 3 mm. lata, intus ubique dense albido-lepidota. *Petala* linearia, antice paululum latiora, breve obtuseque acutata, 3 mm. longa. *Labellum* sessile, e basi cuneata trilobum; lobi laterales oblique oblongi, obtusi; lobus intermedius subquadratus, retusus, latior quam longus, leviter crenulatus, cum callo satis alto a basi medium discum usque decurrente parce farinosum, totum 5 mm. longum, inter lobos laterales 4 mm. latum. *Anthera* manifeste cristata; pollinia magna. *Flores* viridi-lutei.—Fl. Februario.

Tropical Africa. Uganda: epiphytic in forests at 1200 m., *Snowden* 726.

The flowers are densely covered inside with silvery scales, a character not seen in any of the nearly 200 species I have examined. In its general appearance the plant resembles medium sized specimens of *P. Buchanani* Rolfe or *P. Lettowiana* Kraenzl.

Polystachya Johnsonii *Kraenzl.* n. sp. [*Eupolystachyae, Rufinulae*]; differt a *P. nitidula* Rchb. f. cui proxima foliis anguste linearibus obtusis rotundatis, labelli lobis lateralibus etsi parvis bene evolutis liberis.

Caulis basi vix incrassatus, internodiis 3 vel 4 compositus, arcte albido-vaginatus, tota planta cum inflorescentia ultra 30 cm. alta. *Folia* linearia, basi breviter complicata, apice obtusa, oblique bilobula, ad 15 cm. longa, 10–12 mm. lata. *Scapus* tenuis, vaginis albidis arcte amplectantibus acutis apicem usque tunicatus, inflorescentia racemulis 6 (supremo apicali subevanido) secundis densi et multifloris 3 cm. longis composita; rhachis breviter setosa; bracteae circiter 0.5 mm. longae, triangulae, acutae; ovaria 1.5 mm. longa. *Sepalum dorsale* oblongum, acutum, 1 mm. longum, petala linearia aequilongum; sepala lateralia triangula, acuta, 3 mm. longa, medio 2 mm. lata, mentum breve, pro flore minuto amplum, obtusum formantia. *Labellum* e basi cuneato-dilatatum; lobi laterales in medio labello parvi, tamen manifesti divergentes; lobus intermedius suborbicularis, acutus, callus minutus in basi disci dense puberuli; totum labellum 2.5 mm. longum, inter lobos laterales vix 2 mm. latum. *Flores* intense lutei.

Tropical Africa. Gold Coast: Aquapim Hills, epiphytic on high trees, *W. H. Johnson* 588.

A species with unusually small flowers on nodding flower stalks. The plant differs from *P. nitidula* Rchb. f. in characters only to be seen by a very accurate examination.

Polystachya fallax *Kraenzl.* n. sp., [*Cultriformes* s. *Monophyllae*]; differt a *P. monophylla* Schlechter cui simillima videtur inflorescentia breviore pauciflora, floribus majoribus, petalis lanceolatis acuminatis, labelli lobis lateralibus distinctis rhombeis, lobo intermedio lanceolato acuminato.

Rhizoma repens, radicibus crebris longis obsitum, oblique ascendens. *Caules* pseudobulbosi, circiter 1.5 cm. distantes, elongato-conici, profunde sulcati, cataphyllis 2 vel 3 vaginantibus pallidis scariosis omnino tecti, ad 3.5 cm. longi, basi sub anthesi 5 mm. post anthesin ad 8 mm. diametro. *Folium* unicum basi breviter plicatum, strictum, lineare, apice obtusum, 10–11 cm. longum, 8–10 mm. latum. *Scapus* vix semilongus (ad 4 cm.), vagina longiuscula albida vestitus, 3–4-florus, anceps, glaber; bracteae brevissimae, triangulae, acutae, 1.5 mm. longae et basi 1.5 mm. latae. *Sepalum dorsale* lanceolatum, acuminatum, 1 cm. longum, medio 2.5 mm. latum; sepala lateralia subfalcata, anguste triangula, acuminata, mentum leviter curvatum, obtusum formantia, 1.2 cm. longa (mentum 5 mm.), basi vix 3 mm. lata. *Petala* lineari-lanceolata, acuminata, 8–9 mm. longa. *Labellum* e basi cuneata sensim dilatatum; lobi laterales rhombei; lobus intermedius lanceolatus, acuminatus, callus a basi dimidium usque decurrens apice dilatatus, obscurissime trilobus, totum labellum 8–9 mm. longum. *Gynostemium* pro flore longum, anthera cristata.

Tropical Africa. Uganda: Toro, Mpanga River at 1500 m. *M. T. Dawe* 539.

I regret that the description of the flower is not throughout satisfactory, the only flower I had being partly injured by an insect. It is a strange fact, that this true *Polystachya* resembles exactly in habit and size *Epidendrum paleaceum* Reichb. f. of Central American origin (cf. the figure of this plant in Sauders Refugium botanicum II. tab. 87.).

Polystachya coelogynochila *Kraenzl.* n. sp., [*Cultriformes* s. *Monophyllae*]; differt a *P. poikilantha* Kraenzl. floribus majoribus, mento valde evoluto, labello e basi latissima modice dilatato margine undulato cristis 5 erectis denticulatis praedito antice retuso.

Caulis cujus summitas tantum adest, mihi non visus. *Folium* basi cordatum, obovato-ligulatum, obtuse acutatum, 12.5 cm. longum, antice 2.5 cm. latum. *Inflorescentia* (imperfecta) folio brevior, vaginis 1 vel 2 vestita, racemosa, pauciflora; rhachis tenuis, glabra, nutans; bracteae triangulae, acutae, vix 1 mm. longae; pedicelli cum ovariis glabri, curvuli, 1 cm. longi. *Sepalum dorsale* anguste oblongo-lanceolatum, concavum, acutum, 1 cm. longum, cum petalis aequilongis paulo angustioribus linearibus arcte convergens; sepala lateralia falcata, triangula, acuminata, 1.2 cm. longa, medio 3.5 mm. lata, postice mentum obtusum, 5 mm. longum, leviter bisaccatum formantia. *Labellum*

simplex, toto ambitu late oblongum, e basi lata modice dilatatum, antice retusum, fere rectilineum, toto margine undulatum, in tertia antica leviter denticulatum, cum cristis 5 valde undulatis totum per discum magna pro parte parallelis vel vix divergentibus et antice denuo convergentibus, totum labellum 1 cm. longum et quo latissimum 5 mm. latum. *Gynostemium* inusitate (5–6 mm.) longum, margine foveae stigmaticae utrinque dente membranaceo aucto ; pes gynostemii 7 mm. longus. De colore nil constat.

Tropical Africa. Collected in East Africa and grown by Mr. Alfred Cholmlys, Rillington (Yorkshire).

A most remarkable species. The specimen is cut off a little below the insertion of the only leaf and therefore there can be no doubt that the species belongs to the Section *Cultriformes*. In the structure of the lip it is unique among all Polystachyas I have met with, the 5 crests being exactly the same as those found so often in the flowers of *Coelogyne*. There are 2 flower-stalks in the specimens both of the same weak, nodding description, and bearing about 6 flowers. The column is unusually long and slender and the stigmatic cavity is provided on both sides with a membranous tooth.

Polystachya Pseudo-Disa *Kraenzl.* n. sp., [*Elasticae*]; differt a *P. elastica* Lindl. scapo multo altiore, floribus minoribus, sepalis ante apicem cornu minuto praeditis, hypochilio alte carinato.

Folia et radices desiderantur. *Scapus* 30 ad ultra 40 cm. altus, strictus, vaginis compluribus albidis imbricantibus omnino tectus; vaginae arcte appressae, acuminatae, infimae 1–1.5 cm. longae supremae ad 5 cm. decrescentes. *Flores* sessiles, in spicas 8–15 cm. longas, densiusculas, cylindraceas, multifloras dispositi, illas *Disae* cujusdam ex affinitate *D. polygonoidis* Lindl. ludentes; bracteae late ovato-triangulae, acutae, trinerviae, 2 mm. longae; rhachis puberula ; ovarium jam sub anthesi crassiusculum, fusiforme vel leviter obovatum, 6-costatum, sub anthesi 7–8 mm. postea 10 mm. longum. *Sepalum dorsale* oblongum, concavum, apice retusum, 3.5–4 mm. longum, 2 mm. latum; sepala lateralia pedi gynostemii 7 mm. longo affixa, triangula, obtusa ; omnia 3 tenera, clathrata, in dorso ante apicem cornu leviter recurvo instructa. *Petala* obovato-oblonga, obtusa, sepalo dorsali aequilonga et lata, non clathrata. *Labelli* bis geniculati; hypochilium cuneatum vel obtriangulum, cum carina alta triangula antice altiore membranacea per totum longitudinem; mesochilium pulvinatum, circiter subquadratum, basi utrinque lobulatum; epichilium obovato-oblongum, subbilobulum; totum labellum vi expansum 8–9 mm. longum. *Flores* roseo-albi.

Tropical Africa. Probably Uganda, *M. T. Dawe* 964.

It is much to be regretted that roots and leaves are missing. There are 6 flower-stalks fortunately all in good condition, 5 of them being about 30 cm. in height, 1 more than 40 cm. The flowers are only slightly altered by drying and remain fresh when the capsules are ripening. In size and growth the plant resembles very

much some species of *Disa* from the same country. It resembles in the structure of the lip also *P. elastica* Lindl. but this species has only a few larger flowers on very short stalks. As the roots of all the specimens are missing (and the leaves also) we may presume that the former are attached to the bark of the trees in the same way as in *P. elastica* Lindl. and that the leaves (very few and weak in *P. elastica*) are wanting, at least during the flowering season.

Polystachya ashantensis *Kraenzl.* n. sp., [*Calluniflorae*]; differt a *P. Preussii* Kraenzl. inflorescentia racemis compluribus composita, floribus minutis numerosis, labelli ungue glabro disco ecalloso.

Tota planta ad 20 cm. alta, sicca nigra. *Caules* vix pseudobulbosi, tenui-cylindracei, vaginis 2 in basi et 1 longiore tunicati. *Folia* linearia, obtusa, cum vagina ad 12 cm. longa, 5 mm. lata, coriacea. *Scapus* strictus, tenuis, a dimidio (in uno specimine a prima quarta inferiore) racemulis 1.2 cm. longis ubique florifleris e vaginis angustis acutis erumpentibus praeditus; bracteae brevissimae, triangulae, acutae, quam ovaria cum pedicellis multo breviores. *Sepalum dorsale* brevissimum, ovatum, acutum, 1 mm. longum vel vix longius; sepala lateralia antice dorsali aequalia, postice in pileum triplo longiorem, cylindraceum producta, ad 4 mm. longa. *Labelli* unguis longior quam lamina, canaliculatus, glaber, 2.5 mm. longus; lobi laterales ovati, acuti, 1 mm. longi; lobus intermedius fere cochleatus, acutus, ante apicem subtus incrassatus, in disco carunculosus haud pilosus, 1.5 mm. latus et longus, totum labellum 4 mm. longum.

Tropical Africa. Gold Coast: Ashanti, Agogo at 300 m., dry Cedar-Forest, Sept., *Chipp* 578.

The plant is of no beauty whatever but remarkable for its very long protracted lateral sepals and its spoon-shaped lip.

Polystachya spiranthoides *Kraenzl.* n. sp., [*Calluniflorae*]; differt a *P. stricta* Rolfe floribus multo minoribus, a *P. Stuhlmanni* Kraenzl. inflorescentia racemis compluribus composita.

Adest solummodo inflorescentia 17 cm. longa. *Scapus* anceps, vaginis praelongis brunneis tunicatus, sparsissime setosus; racemi 6, leviter torti, scapo arctissime appressi, erecti, 12–15-flori; bracteae triangulae, vix 1 mm. longae, acutae. *Sepalum dorsale* ovato-oblongum, acutum, concavum, vix 2 mm. longum, 1.5 mm. latum; sepala lateralia late ovata, suborbicularia, brevissime acutata, concava, 2 mm. longa, fere 2 mm. lata. *Petala* linearispathulata, apice ipso obtusata, 2 mm. longa. *Labellum* sessile; lobi laterales latissime oblongi, fere semi-orbiculares, antice rotundati; lobus intermedius subquadratus, retusus, cum apiculo acuto adeo reflexo ut lobus antice emarginatus appareat, callus brevis in ipsa basi disci; discus lobi intermedii dense farinaceo puberulus, totum labellum paulum ultra 2 mm. longum et lobis lateralibus expansis 2 mm. latum; omnia phylla flores etiam petala et labellum anguste clathrata.

Habitat unknown. Flowered at the Royal Botanic Gardens, Kew, originally from Sir Trevor Lawrence, Bart. Coll. *Pam.*

A very doubtful species which I establish with hesitation. It agrees with *P. stricta* Rolfe in all technical characters except the size, while it differs from *P. Stuhlmanni* Kraenzl. in its inflorescence and the lip. The whole appearance of the inflorescence recalls (to me at least) *Spiranthes australis* Lindl. The comparison is not a very good one but for the moment I cannot find any better. The little racemes are slightly twisted around the axis and the flowers are as small as in *Spiranthes*.

Polystachya Ugandae *Kraenzl.* n. sp., [*Superpositae*]; differt a ceteris speciebus sectionis statura multo minore, pseudobulbis vix sic dicendis caulinis, inflorescentiis brevibus paucifloris racemosis, floribus majoribus.

Epiphytica; pseudobulbi tenues, caulini, saepius leviter curvuli, omnino cataphyllis griseis vestiti, ad 4 cm. longi, vix 2 mm. crassi, paucifoliati. *Folia* linearia, 3 vel 4, apice bilobula, 4–6 cm. longa, 3 mm. lata, quam racemus brevis pauciflorus multo longiora. *Scapus* inter folia suprema fere omnino absconditus, brunneo-pilosus; flores 3–4; bracteae e basi latiore triangulae, acutae, 1.5 mm. longae; ovaria cum pedicellis ad 4 mm. longa, minute pilosa. *Sepalum dorsale* late ovatum, acutum, concavum, 3 mm. longum, basi 2.5 mm. latum; sepala lateralia oblique triangula, acuta, mentum perbreve, leviter bisaccatum formantia, ad 5.5 mm. longa, 3 mm. lata, omnia tesselata vel clathrata; mentum 3.5 mm. longum. *Petala* lineari-spathulata, apiculata, tenerrima, 2.5 mm. longa, vix 1 mm. lata, tenuissime clathrata. *Labelli* sessilis vel brevissime unguiculati, lobi laterales breves, ubi liberi divergentes, oblongi, obtusi; lobus intermedius suborbicularis vel transverse oblongus, medio subbilobulus; discus glaber vel vix farinosus; callus in basi carinaeformis, altus, membranaceus; pes gynostemii brevissimi 2.5 mm. longus. *Flores* viridi-lutei; labellum purpureo-guttatum. Fl. Novembri.

Tropical Africa. Uganda: Toro, 1500 m., *Snowden* 737 flowered at Kampala. Zanzibar: *Last*.

Differs from all the other species of this section in the slender stems and in its comparatively large flowers. The tall membranous keel on the surface of the labellum is a very good character.

XXXVI.—A REVISION OF ENGLERASTRUM.

A. H. G. Alston.

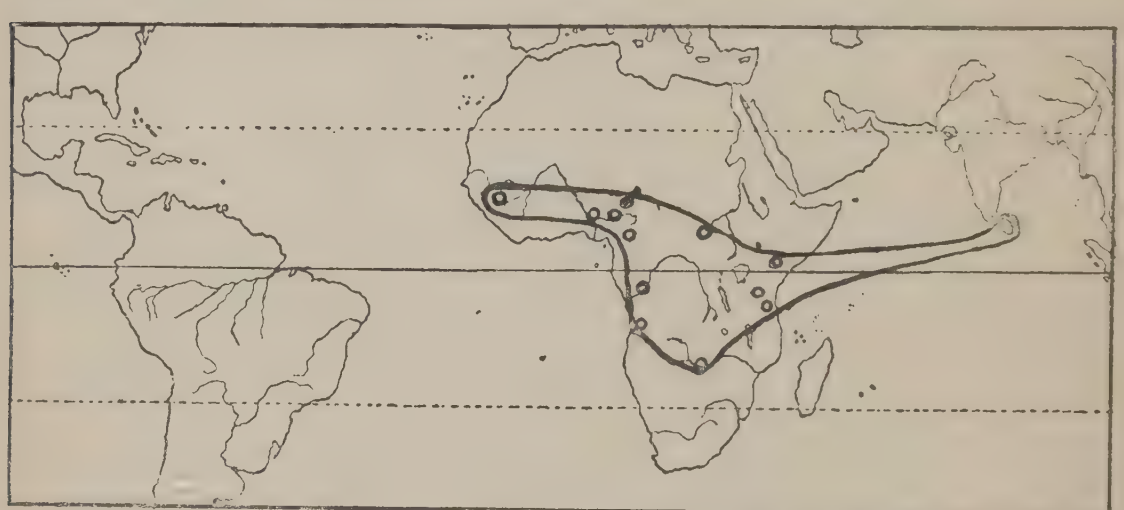
The genus *Englerastrum* was founded by Briquet* in 1894 on *E. Schweinfurthii* Briq., a plant discovered by Schweinfurth in North East Central Africa. The genus is in some respects intermediate between *Plectranthus* L'Hérit. and *Coleus* Lour. From

* Engl. Bot. Jahrb. 19:178 (1894).

the latter it is readily distinguished by the subequal calyx-teeth, and the fact that the stamens, though connate, do not form a tube. It approaches *Plectranthus* more closely, in particular the section *Isodon*, being only distinguished by its connate stamens and peculiar habit.

Five years before Briquet founded his genus, Trimen described a plant from the Ritigala Hill, Ceylon, as *Coleus elongatus*.* A recent examination of this plant suggests that it would be better placed in the genus *Englerastrum*, next to *E. scandens* Alston, *comb. nov.* (*Coleus scandens* Gürke), from which it is scarcely distinct.

Willis† suggests that *C. elongatus* Trim. was derived from the very distinct *C. Forskohlii* Briq. (*C. barbatus* Benth.). He states "its nearest relative is *C. barbatus* which also occurs on the summit of Ritigala." But it seems more reasonable to believe that the scarcely distinguishable *E. scandens* Alston from East Africa is its nearest ally, and that though now widely separated, their areas were once continuous.



Distribution of the genus ENGLERASTRUM; the small rings show the records for Tropical Africa, mainly at fairly high altitudes on the older parts of the ancient plateau. One species in Ceylon.

I wish to express my indebtedness to Mr. J. Hutchinson for his assistance.

CLAVIS SPECIERUM.

Racemi laxi; folia sessilia vel subsessilia, integra vel crenata, subpersistentia; caules rotundati vel quadrati, circiter 2 mm. diametro:

Pedicelli usque ad 3 mm. longi:

Folia ovato-suborbicularia, 1.2–2.5 cm. longa, 1–2 cm. lata, crenulata; French Guinea ..... 1. *djalonense.*

Folia basi et apice plus minusve acuta:

Racemi subsimplices; folia plerumque ovata; caulis rotundatus:

* Journ. Bot. 1889: 165.

† Age and Area, 151 (1922).

Florum verticillastra 1–4 mm. inter se distantia; radix ramosa; E. & S. Trop. Africa .....2. *Schweinfurthii*.
Florum verticillastra 5–20 mm. inter se distantia, rhizoma subterraneum ; Congo .....3. *Schlechteri*.
Racemi ramosi:
Folia plerumque integra, apice obtusa leviter acuminata; Rhodesia .....4. *rhodesicum*.
Folia obovato-lanceolata, apice acuta, 1.75 cm. longa 0.6 cm. lata vel majora; Nigeria...5. *Hutchinsonianum*.
Pedicelli 15 mm. longi; folia lanceolata; caulis quadratus; Nigeria .....6. *diffusum*.
Racemi compressi, unilaterales; folia plerumque longe petiolata, crenata, caducissima (in *E. nigerico* ignota); caules quadrati, circiter 3 mm. diametro:
Flores pedicellati; caulis minute puberulus; Nigeria..... 7. *nigericum*.
Flores sessiles:
Caulis minute puberulus; flores pallide purpurei (*Trimen*); folia ovato-triangularia, subacuminata; Ceylon ..... 8. *elongatum*.
Caulis pilosus; flores coerulei (*Gürke*); folia rotundato-ovata, acuta; Tanganyika Territ. .....9. *scandens*.

1. **Englerastrum djalonense** *A. Chev.* in Journ. de Bot. 22:127 (1909).

Tropical Africa. French Guinea: on dry ferruginous plateaux between Timbo and Bouria, *Chevalier* 18495 (not seen).

2. **Englerastrum Schweinfurthii** *Briquet* in Engl. Bot. Jahrb. 19:178 (1894) ; Hiern in Cat. Welw. Afr. Pl. 860 (1900).—*Coleus dissitiflorus* Gürke in Engl. Bot. Jahrb. 19: 221 (1894).

Tropical Africa. Bongo-land: Addai, *Schweinfurth* 2532 (type). Kenya Colony: *Mitten*. Rhodesia: Sesheke, *Gairdner* 509: near Victoria Falls, *Allen* 410. Angola: Pungo Andongo; near the great cataract of the river Cuanza, near Condo, *Welwitsch* 5522.

3. **Englerastrum Schlechteri** *Alston*, comb. nov.—*Plectranthus Schlechteri* Gürke in Schlechter, Westafr. Kautschuk.-Exped. 311 (1900), nomen.

Herba ramosa; caulis rotundatus, pilosus; rhizoma subterraneum, radicibus fibrillosis. *Folia* caduca, ambitu ovata, basi cuneata, breviter petiolata, apice obtusa, 3 cm. longa, 1.75 cm. lata, distincte crenata. *Inflorescentia* racemos simplices formans; florum verticillastra 5–20 mm. inter se distantia, 1-2-flora; pedicelli 3 mm. longi; bracteae usque ad 2 mm. longae. *Calyx* 2 mm. longus, puberulus. *Corolla* non visa. *Carpella* flavo-brunnea, compressa.

Tropical Africa. Belgian Congo: Dolo, near Stanley-Pool, *Schlechter* 12490 (type). Cameroons: near river Dja, in the

primaeval forest, *Schlechter* 12769 (not seen) ; near Mnea, in the primaeval forest, 600 m., *Schlechter* 12850.

4. **Englerastrum rhodesicum** *N. E. Brown* in Kew Bull. 1922 : 31.
TROPICAL AFRICA. Rhodesia: near Mumbwa, *Macaulay* 637 (type); Livingstone, in sand, 1000 m., *Rogers* 7205.

5. **Englerastrum Hutchinsonianum** *Alston*, sp. nov.
Herba annua, ramosissima; caulis tetragonus, molliter et leviter pilosus. *Folia* caduca, lanceolata, basi cuneata, breviter petiolata, apice acuta, distante serrata vel integra. *Inflorescentia* racemos compositos formans; florum verticillastra 1–7 mm. inter se distantia, plerumque uniflora; pedicelli 2 mm. longi; bracteae usque ad 0.75 mm. longae. *Calyx* 2 mm. longus, pilosus. *Corolla* coerulea, calyce triplo longior; labium superum 0.5 mm. longum; labium inferum 1.5 mm. longum, plus minusve puberulum; tubus 1.5 mm. longus. *Stamina* basi longe connata. *Carpella* brunnea, nitentia, compressa.
TROPICAL AFRICA. Northern Nigeria: Mount Patti, Lokoja, *Dalziel* 105.

6. **Englerastrum diffusum** *Alston*, sp. nov.
Herba ramosa; caulis tetragonus, molliter pilosus. *Folia* caduca, lanceolata, vix petiolata, basi cuneata, apice obtuse cuneata, superne distante serrata. *Inflorescentia* racemos compositos formans; florum verticillastra 4–8 mm. inter se distantia, 1–2–flora; pedicelli 15 mm. longi; bracteae minutissimae. *Calyx* 1.5 mm. longus, fructu 3 mm. longus, pilosus. *Corolla* coerulea, calyce duplo longior, glabra, usque ad 3 mm. longa. *Stamina* basi leviter connata. *Carpella* brunnea, nitentia, compressa.
TROPICAL AFRICA. Nigeria: Nupe, *Barter*; Muri Province, weed in arable land, *Lamb* 72.

7. **Englerastrum nigericum** *Alston*, sp. nov.
Herba ramosa; caulis tetragonus, glaber vel minute puberulus. *Folia* caducissima. *Inflorescentia* axillaris et terminalis, racemos compositos vel simplices unilaterales formans; florum verticillastra 2 mm. inter se distantia, 1–2–flora; pedicelli 2 mm. longi ; bracteae florales minutae. *Calyx* 1.5 mm. (fructu 3 mm.) longus, pubescenti-glandulosus. *Corolla* calyce usque ad triplo longior. *Stamina* basi leviter connata. *Carpella* nitenti-brunnea, compressa.
TROPICAL AFRICA. Northern Nigeria: Katagum District, fls. blue, *Dalziel* 109.

8. **Englerastrum elongatum** *Alston*, comb. nov.—*Coleus elongatus* Trim. in Journ. Bot 1889: 165; Handb. Fl. Ceylon 3 : 375, t. 74.
CEYLON. Only found near the summit of Ritigala Hill, North-central Prov., at about 750 m. trailing over rocks, fl. July, *Trimen* (type).

9. **Englerastrum scandens** *Alston*, comb. nov.—*Coleus scandens* Gürke in Engl. Bot. Jahrb. 19:221 (1894),

Tropical Africa. Tanganyika Territory: Usambara; Mswga to Kwa Mshusa, 1300 m., *Holst* 9119, 9120a (co-types); Marangu, Kilimanjaro, 1450 m., *Volkens* 1431.

XXXVII.—MISCELLANEOUS NOTES.

In the recent King's Birthday Honour List the Director received the Honour of the Companionship of The Most Distinguished Order of St. Michael and St. George. Mr. G. H. Cave, formerly a Student Gardener at the Royal Botanic Gardens, Kew, and lately Curator, Lloyd Botanic Gardens, Darjeeling, was appointed a Member of the Most Excellent Order of The British Empire.

We learn that Mr. F. J. Rae, B.A., B.Sc., B.Ag., has been appointed Government Botanist and Director of the Botanic Gardens, Melbourne, in the place of the late Mr. William Laidlaw.

The Secretary of State for the Colonies has appointed Mr. F. C. Deighton, B.A., Mycologist, Lands and Forests Department, Sierra Leone.

A Municipal Educational Garden.—The Town Council of Swansea have recently made an interesting innovation by including amongst the other attractions of their parks, a garden of Economic Plants and a collection of the Wild Plants of the British Isles. The economic collection numbers some 430 species and includes a large number of the most important commercial plants, together with others of minor value. The old kitchen garden on the Singleton Abbey estate, now Singleton Park, has been developed for the purpose, the glass houses being used for tender subjects, and the open ground for hardier plants. The British plant collection has been formed in the same park, and an idea of its scope may be gathered from the fact that it already includes 1500 species, provision being made for water, bog, rock, dry land, and other plants. An Index of the Economic Plants has been published for the guidance of those who use the garden. It gives the scientific and common name of each plant, the part used, and the object for which it is used. There is also a shelter for the use of students, who wish to study the collections. The Council are to be congratulated on their initiative in making this innovation. Too often the activities of those who are in charge of public parks are limited to the production of playing grounds and gaudy displays of summer bedding plants, and it is refreshing to find a body of Town Councillors turning their attention to the scientific and educational side of horticulture. They are fortunate to have in Mr. D. Bliss a Parks' Superintendent

capable of carrying out their wishes to such a remarkable extent. There can be little doubt but that the innovation will have far-reaching effects. It is understood that the Parks' Superintendent will distribute seeds of many of these plants as they become available

W. D.

Glyptostrobus and Taxodium.—In Vol. XXXVII, Section B. No. 13, of the Proceedings of the Royal Irish Academy, May 1926,* Professor Augustine Henry and Miss Marion McIntyre present a critical account of the Swamp Cypresses, *Glyptostrobus* of China and *Taxodium* of America, with notes on allied genera. They begin with an historical account of *Glyptostrobus pensilis* Koch (*G. heterophyllus* Endl.), which indicates that although this species now only occurs in two localities in south-eastern China, the genus was in pre-historic times widely distributed over North America, Europe and Asia and that fossil remains show that the only remaining species represents a very ancient type of vegetation. In discussing the botanical characters the authors give macroscopic and microscopic details whenever necessary, concerning branchlets, leaves, flowers, cones, seeds and wood. The characters of seedlings and of fossil species also receive attention. *Taxodium* is discussed in the same way and a comparison is made between the wood of *Glyptostrobus*, *Taxodium*, *Wellingtonia* and *Sequoia*. The authors describe three Taxodiums—*T. distichum* Rich., *T. adscendens* Brong, and *T. mucronatum* Ten. *T. adscendens* they consider to be but a form of *T. distichum* which only bears the acerose type of foliage; but the Mexican *T. mucronatum* they regard as a distinct species both by reason of certain small botanical differences and by its distinct geographical area. Owing to various differences which occur in foliage, cones and wood, between the two trees usually met with under the names of *Sequoia sempervirens* and *S. gigantea*, the authors have retained the name of *Wellingtonia gigantea* for the latter species, a name that was given to the tree by Lindley in 1853. The results of their critical examination of the wood of these four genera will be found to be very useful, more particularly as in addition to the stem wood, critical examinations have been made of the "knees" or pneumatophores of *Taxodium* and *Glyptostrobus* growing in swampy soil. Six full page plates of drawings of shoots, flowers, cones, seeds and wood, give additional value to the work. There are also two full page photographs of the Swamp Cypresses.

W. D.

Botanical Magazine.—The third part of Volume CLI (1925) was published on June 21st, 1926, and contains plates and descriptions of the following plants:—

Actinidia kolomikta Max. (t.9093), from Eastern Asia; *Spiranthes Pamii* Braid (t.9094), a native of the Western Argentine;

* Obtainable from Messrs. Williams & Norgate, London, and from Messrs. Hodges, Figgins & Co., Dublin. Price 1s. 6d.

Rhododendron saluenense Franch. (t. 9095), from North-west Yunnan; *Cordyline indivisa* Steud. (t.9096), a native of the North and South Island, New Zealand; *Jasminum Beesianum* Forrest & Diels (t.9097), a native of Central Szechuan, Kweichou and North Yunnan; *Polygonum campanulatum* Hook.f. (t.9098), from India and China; *Pyracantha atalantioides* Stapf and *P. yunnanensis* Chittenden (t.9099), from China; *Primula siamensis* Craib (t.9100), a native of the mountains of North-west Siam; *Mammillaria conopsea* Scheidweiler (t.9101), from Central Mexico; *Berberis lycioides* Stapf (t.9102), from the North-west Himalaya; *Mesembrianthemum stellatum* Mill. (t. 9103), a native of the Karoo of Uitenhage, South Africa, and *Fritillaria Olivieri* Baker (t.9104), from Western Persia.

Selection of Hevea brasiliensis.—The Malayan Agricultural Journal for February, 1926, contains an article by Mr. F. G. Spring, dealing with yields of rubber from bud-grafted trees on Kajang Estate (Sungei Reko), and giving some particulars of successful experiments in the vegetative reproduction of rubber trees. In view of recent experiments in generative selection, to which reference was made in *Kew Bulletin*, 1919, p. 317, 1920, p. 113, 1921, p. 349 and 1925, p. 44, some extracts from Mr. Spring's paper will be of interest.

No records were kept of yields of the mother trees from which buds were taken, but they were known to have given very high yields for a number of years; they were 13 years old when used for budding purposes. The seed for stocks was not selected in any way; it was planted in the field, at stake, and budded when one year old. Budding in the field commenced in October and November, 1921. The time from cutting back the seedlings to the beginning of December, 1925, was approximately 4 years.

Tapping commenced in the last week in August, 1925, on a half spiral daily cut at 20 inches from the ground; it was continued for five and a-half weeks, after which the trees were rested for a similar period. On November 8th, 1925, the half spiral left cut was re-opened, and the system of tapping was changed to alternate day tapping; when records were first taken on the 3rd December, 1925, 4 inches of bark had been removed. Mr. Spring made 14 records of yields, visiting the estate on each occasion, seeing the tapping conducted, and himself collecting and taking away the latex. The rubber was subsequently weighed at the office of the Department of Agriculture, Kuala Lumpur.

The author gives three tables showing results from selected and numbered trees: (1) With bud-grafted trees Clone I (one group of which contains 308 trees), the highest average yield was 24·5 grams per tapping, the poorest yield was 9·1 grams per tapping. (2) With bud-grafted trees mixed Clones 1 and 9 (a mixed Clone of 94 trees), the highest average yield was 28·7 grams per tapping, the poorest 12·3 grams per tapping. (3) With the control trees (non-budded), the highest average yield was 12·6 grams per tapping and

the poorest 2·3 grams per tapping. The number of control trees distributed throughout the budded area occupied by Clones 1 and 9 is 31; at the time of writing these were approximately 5 years old.

The trees from which these test yields were obtained were selected indiscriminately throughout the area, previous to the first day's experimental tapping. As far as was possible the control trees were selected adjacent to the budded trees from which the yields were taken. The budded area tested by tapping on Kajang and Sungei Reko Estates is approximately 70 acres in extent.

The characteristics of the budded trees are low branching, similarity in appearance of trees of the same Clone, large leaves and dark green foliage, and clean bark. The bark renewal of the budded trees appears to be satisfactory.

It would not be advisable to conclude this notice without giving the guarded opinion of Mr. Spring that "although it is realised from a statistical point of view that it would not be correct to arrive at any definite conclusions, the figures obtained do show remarkably higher yields in the case of the budded trees."

J. H. H.

Life of Plants*.—A considerable number of well-written books, introducing the general reader to the study of botany, have been published in the last few years. Some of these have not reached so wide a public as is desirable on account of their cost. The compact and attractively printed and illustrated work now issued by the Clarendon Press at a very moderate price should have a wide circulation. The author desired "to suggest that Science is more than a body of doctrine—an illumination of life". With a wide range of subject matter arranged in nine chapters he has most certainly succeeded in giving a compact up-to-date biography of many aspects of plant life. As would be judged from the title, the basis of the book is the physiology of plants, a subject which readily lends itself to popular exposition. It is, however, rare to find allegories and similes used so aptly and yet in so restrained a manner as here. A clearly written chapter on variation, evolution and heredity is included. It is to be regretted that no bibliographical references are given, to serve as guide posts for the serious reader directing him to further reliable literature.

Grasses and Fodder Plants of New South Wales†.—Mr. Breakwell has spent many years in experimental work, the results of which have been published from time to time in the Agricultural Gazette of New South Wales. These results, together with much additional information, have been embodied in the present work.

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* Life of Plants, by Sir Frederick Keeble, Oxford, Clarendon Press, 1926, pp. xii. + 256, ill. 52. Price 5s.

† The Grasses and Fodder Plants of New South Wales, by E. Breakwell. Govt. Printer, Sydney, New South Wales, 1923, pp. 370 + vii., figs. 183. Price 6s.

The first part of the book deals with grasses, both native and exotic, and the second with other fodder plants. The opening thirty-six pages give much valuable information on such subjects as good and bad pasture grasses, choice of mixtures, palatability of grasses, germination, methods of sowing, management and improvement, pastures, lawn grasses, weeds, etc. A non-technical classification follows, based on easily observed characters in which the commoner economic grasses are divided into nine sections. Each section, consisting of a number of genera, is accompanied by a simple key, as are the genera with more than one species. Most of the species are illustrated, and good cultural details are given.

The second part deals with Lucerne, Clovers, Vicias, etc. Several chapters of this part are by Mr. J. N. Whittet on similar lines to those on the grasses.

The book will be found of use to many besides Australian farmers, especially in countries where similar climatic conditions prevail, such as South Africa and parts of India.

Flora of the Transvaal*.—To students of African botany an area such as that of the Transvaal is of considerable interest from many points of view. On account of its geographical situation, besides a large percentage of endemic species, outliers from the great Tropical African flora to the north here meet those from the Cape flora to the South, the result being an assemblage of plants of very diverse form and affinity. Consequently they present no little difficulty in their taxonomic treatment, and Dr. Burtt Davy is to be warmly congratulated on his public spiritedness in providing, mostly at his own expense and risk, this handy Manual of the Flowering Plants and Ferns of the area, including Swaziland. As a large number of species extend into adjacent territories, the manual should also prove useful over a much wider field than that indicated in the title, especially for the Orange Free State, Bechuanaland, parts of Natal, and even for Rhodesia.

The author's statement that "the publication of a local *Flora* stimulates the collection and study of plants" cannot be too strongly emphasized. He has himself had the advantage of studying the flora of the Transvaal in the field, and he divides the country into two main zones, A. the Tropical and Sub-tropical Plateau Zone, and B, the Warm Temperate Plateau and Montane Zone, the latter including most of the Highveld and the Drakensberg Range. In the text the phytogeographical range of each species is indicated by reference to the Magisterial Districts, of which there are twenty-three. A little practice will soon accustom the student

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* A Manual of the Flowering Plants and Ferns of the Transvaal with Swaziland, South Africa, by Joseph Burtt Davy. Part I. Pteridophyta to Bombacaceæ; pp. 269, illustrated, 15s. net. Longmans, Green & Co., Ltd., 39, Paternoster Row, London, E.C.4 (1926).

to the abbreviations used for these districts. Considerable space has been saved by the abbreviation of words used repeatedly in the text and by the condensation of generic and specific descriptions in key form. In this way the essential characteristics of genera and species are emphasized. If fuller descriptions are necessary, reference is given under each genus to the *Flora Capensis* or other works.

In this first part of 269 closely printed pages is included also an Analytical Key to the families of Flowering Plants (Dicotyledons) Gymnosperms and Ferns, 40 line drawings by W. E. Trevithick and Mrs. Burtt Davy and numerous critical and economic notes. The latter especially should be useful to farmers and others on account of several plants being poisonous to stock. There is also a chapter on plant collecting, an illustrated glossary of terms and list of abbreviations, and in addition, a somewhat unusual feature in a local flora, latin descriptions of 131 new species and varieties of plants.

In his introductory chapter the author expresses dissatisfaction with the existing systems of classification and has adopted the sequence of families proposed by Hutchinson in the Kew Bulletin and in his recent book. This will greatly facilitate comparison with the projected regional floras of Tropical Africa now in preparation at Kew.

No doubt expense has had to be considered very closely in the publication of this work, as its circulation will be necessarily somewhat limited. Otherwise a thicker paper and somewhat larger print with wider spacing would have been a great advantage, especially for the descriptive keys, which will be most used by the field botanist.

The Classification of Flowering Plants.—The artificial key to " The Families of Flowering Plants " referred to in a notice of that book in Kew Bulletin, 1926, p. 143, has now been published separately in pamphlet form.* In this convenient form one of the most interesting and useful sections of Mr. Hutchinson's book is now available at a small price.

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* Key to the Families of the Dicotyledons, by J. Hutchinson. Macmillan & Co., St. Martin's Street, London. 1926. Pp. 54. Price 2s.

Printed under the authority of His Majesty's Stationery Office
By Wyman & Sons, Limited, Fetter Lane, London, E.C. 4.

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1926

ROYAL BOTANIC GARDENS, KEW

XXXVIII.—FUNGI FROM KENYA COLONY.* M. M. DUKE.

During the past few years many collections of fungi from Kenya Colony have been received at Kew and elsewhere, and when new species have occurred, they have been described in various periodicals. No systematic enumeration, however, of the fungus flora has hitherto been attempted, and there was no ready means of reference to these descriptions. With the growing importance of agriculture in the country, and the work now being carried out by resident mycologists, the need of such an enumeration has been increasingly apparent. To meet this requirement, the present preliminary list has been prepared.

Kenya Colony lies between 5° North and 5° South of the Equator, and between the 34th and 43rd parallels of East Longitude. From a low-lying coastal belt and plains directly inland, the country rises towards a central tableland of from 6,000 to 8,000 ft., culminating in Mt. Kenya, 17,040 ft. high. There are thus two distinct physical and climatic regions with a corresponding differentiation in the vegetation.

The climate of the highland regions, which lie across the Equator, is temperate, while above 7,000 ft. it becomes colder and frosts are experienced. The rainfall of these uplands is between 40 and 50 inches a year. In this temperate climate European and even British fungi flourish. The chief crops grown in the central and western highlands are potatoes, fruit, vegetables, maize, simsim and beans. Coffee, wheat and barley are cultivated with great and increasing success. Since the growing of these crops forms such an important factor in the commercial interests of the country, it is not surprising to find that many of the records from this part are fungi associated, whether pathologically or not, with these crops.

The following remarks on the lowland coastal belt are based on notes supplied by Mr. T. D. Maitland. He collected in this region in the tropical belt from Mombasa in the south, to Witu in the north. The rainfall at Mombasa is, on an average, 50 in. a year, decreasing northwards to 37 in. at Witu. There are two rainy periods annually due to the monsoons, and alternately two

* Lists of the fungus flora of other British Colonies have been published in the *Kew Bulletin* as follows :—

Nigeria—*Kew Bull.* 1912, p. 141 ; 1914, p. 253 ; 1917, p. 105.

Uganda—*Kew Bull.* 1917, p. 1 ; 1920, p. 289.

(639.) Wt. 55—7. 1,000. 8/26. Wy. & S., Ltd. Gp. 50, (4.)

dry periods of excessive heat, and consequently rapid evaporation. During the dry season the country becomes parched, and presents a very unpromising unfertile appearance, but with the onset of the rains the whole aspect is quickly changed, the parched grassland becomes green, and dried-up trees are clothed with foliage.

The vegetation throughout this portion of the coast is, in spite of the rainy seasons, of a typically xerophilous character. One outstanding feature is the wide distribution of the " Doum " palm, *Hyphaene thebaica* Theban, which can withstand the semi-arid conditions and the annual grass fires. From Mombasa northwards these palms increase in number, whilst southwards they decrease in proportion to the increase in rainfall. In addition to the " Doum " palm other characteristic plants are scrubby Euphorbias, Aloes, Sansevierias and Zamias, together with many succulents. Along the coast are numerous coconut palms, mangroves, etc., while the crop plants are chiefly grains, cassava, sweet potatoes and rice, the latter where conditions at river mouths are favourable.

The particular areas of the coast belt over which observations were carried out were Mombasa and Mazeras localities, which include Rabai, Ribi, Mwachi, and Chamgamwi; Kilifi and Malindi, 30 and 50 miles to the north of Mombasa respectively, and Lamu and Witu near the estuary of the Tana River in the north. In the Mazeras region are several small forests; these and the Gongoni forest near Lamu and Witu were examined fairly thoroughly, and this latter area provided a fine fungus field. At Kau, on the banks of the Ozi, a tributary of the Tana, are numerous rice fields on the sites of small forests. On dead logs which remain, and which are occasionally submerged by floods, some fine material of *Polystictus funalis* Fr. was gathered, and also *Trametes corrugata* (Pers.) Bres.; this latter was of the thick hoof-shaped type with the red staining at the base very pronounced. On the under side of these fallen logs large sheets of *Stereum Schomburgkii* Berk. were observed. This has a slightly " shot " appearance when young and fresh, owing to the numerous bristles and setae on the pileus. *Trametes cingulata* Berk. was common almost everywhere, even on the old posts at the Arab wells, and on the old and hard " boriti " (mangrove poles) lying on the sea beach at Lamu. *Polystictus xanthopus* Fr. and *Polystictus incomptus* Fr. were found to be common in the forest regions. *Ganoderma lucidum* (Leys.) Karst. was very frequent in forest clearings, especially in the Witu district. These fungi were usually found as stiped, broadly pileate forms growing up from the dead roots, also on dead palm stumps, and on living " Doum " palms which had been injured presumably by grass fires. Yellow forms of this species have been collected on several occasions, and at Mombasa this form had quite taken possession of an old *Casuarina* stump near the sea. A type which seems to enjoy a hot moist sandy soil charged with humus is *Lentinus Tuber-regium* Fr., several fine groups of which were seen in sandy soil associated with debris from old palm stumps near

Kau and Witu. Numerous sclerotia of this fungus were found in *Oryctes* Beetle traps, which are pits filled with palm debris.

One of the most curious fungi collected by Mr. Maitland in this coastal belt is *Podaxon loandensis* Welw. & Curr., which was found almost at tidal level at Lamu Bay, and again in an old Arab graveyard near Mombasa. The sporing head of this fungus is set on a long column or stipe, and resembles at first sight a partly developed Agaric. Another interesting record is *Ganoderma Emini* P. Henn. It has usually a long stipe, often a foot long, with a small circular pileus. This and the stipe are shiny and laccate. The stipe is normally centrally attached, but at times, owing to the position of the plant to the matrix, the pileus is only partly developed and the stipe appears laterally attached. The first group observed was on the dead upturned roots of a prostrate M'sandarusi tree (*Trachylobium Hornemannianum* Hayne) in the Mazeras Forest. The mycelium had travelled from the base of the roots and rootlets, and thrown up sporophores at the points. The same fungus was observed again in the open, springing up round trees. The pilei were very much bleached by the sun and rather poorly developed.

Two other fungi common in this region are *Trametes hydnoides* (Sw.) Fr., occurring on a variety of hosts but mostly on the "rain tree" (*Pithecolobium saman* Benth.), and *Polystictus occidentalis* (Kl.) Fr., which is ubiquitous.

Fomes rimosus (Berk.) Fr. occurs on *Afzelia cuanzensis* Welw. and is frequent on Acacias and many other trees in the Savannah, often on the end of broken limbs which have partly healed up. It is apparently a slow parasite similar as regards its parasitic habits to *Polyporus hispidus* (Bull.) Fr. of the Ash. Some of the trees carrying large sporophores showed little sign of disease. The fungus occurs all along the Coast belt and was seen amongst the Acacia scrub on the waterless tract inland.

The specimens on which this enumeration is based are chiefly from collections made by Mr. T. D. Maitland, when he was chief of the Economic Plant Division, Nairobi; Mr. W. J. Dowson, formerly Mycologist to the Agricultural Department, Kenya; Mr. J. McDonald, Mycologist (Agricultural Department, Kenya) and Mr. R. Dummer. Reference has also been made to Miss A. Lorrain Smith's "East African Fungi" (Journ. Bot. xxxiii, 1896, p. 340), Herrn H. & P. Sydow's "Fungi africani novi" (Engl. Bot. Jahrb. xlv, 1910, p. 259), and the Annual Reports of the Department of Agriculture, Kenya, 1919–24.

This paper was undertaken at the suggestion and under the kind supervision and help of Miss E. M. Wakefield.

Agaricaceae.

Lentinus villosus *Kl.* in Linnaea viii, 1883, p. 479.
On fallen trunks, etc., near the coast, *Dowson* 181.

Lentinus velutinus *Fr.* in Linnaea v, 1830, p. 510.
On a well-decayed tree trunk, Gongoni Forest, Sept., *Maitland* 527.

Lentinus Tuber-regium *Fr.* Epicr. p. 392.
In sandy soil round Kau and Witu, *Maitland* ; nr. Mombasa, *Maitland*.

Lenzites abietina (*Bull.*) *Fr.* Epicr. p. 407.
On a prostrate log a few feet above high-water mark, Lamu, Sept., *Maitland* 518.

Schizophyllum commune *Fr.* Syst. Myc. i, p. 333.
On felled and barked *Warburgia ugandensis*, forests at Njoro (Rift Valley), 7500 ft., rainfall about 30 in., *Dowson* 172; nr. Mombasa, *Maitland* 513; Gopo lal Mari, 9th June, *Gregory*.

POLYPORACEAE.

Polyporus arcularius (*Batsch.*) *Fr.* Syst. Myc. i, p. 342.
Nairobi, *Dowson*.

Polyporus gilvus (*Schw.*) *Fr.* Elench. i, p. 104.
On a prostrate log, Gongoni Forest, Sept., *Maitland* 546; on a decayed stump, Mazeras Forest, Jan., *Maitland* 571.

Polyporus durus *Jungh.* Crypt. Java, p. 62.
On a dead tree trunk, Mazeras Forest, Jan., *Maitland* 566.

Polyporus (Amauroderma) conjunctus *Lloyd*, Myc. Notes v, 1918, p. 812.
Amongst grass on ground beneath trees, and attached to dead roots, Mazeras, Jan., *Maitland* 561.
Always associated with *Ganoderma lucidum*. The spores of these specimens are very pale brownish when mature.

Ganoderma lucidum (*Leys.*) *Karst.* in Rev. Myc. 1881, No. 9, p. 17.
Rabai Hills, *Rev. W. E. Taylor*; Ngatana, sandy steppes N.E. of Giri Mangea, *Gregory*; on trunks, etc., near coast, *Dowson* 174; on a dead stump, Mwachi River, Mazeras, *Maitland* 583; young forms, Kisimani (Mazeras) Forest, *Maitland* 582.

Ganoderma Alluaudi *Pat. et Har.* in Bull. Soc. Myc. Fr. xxv, 1906, p. 117.
Nairobi; Kikuyu, Aug., 1903, *Alluaud*; Nairobi, *Dowson* 526.

Ganoderma Emini *P. Henn.* in Engl. Bot. Jahrb. xvii, 1893, p. 24.
Growing associated with the roots of a dead tree, Mazeras Forest, June, *Maitland* 539.
Fairly common in such situations.

Ganoderma Henningsii *Lloyd*, Synopsis Stip. Polyp. 1912, p. 105.
Forest, Nairobi, *Maitland* 586; Mombasa, *Maitland* 539 p.p.

Ganoderma simulans *Wakef.* in Kew Bull. 1922, p. 161.
On ground under bushes and growing up from dead roots of trees. Mazeras, March, *Maitland* 556.
Fairly plentiful in this locality but no very regular specimens obtained. Large specimens generally eaten by insects and broken up. Ungulate forms develop on sides of stumps.

Ganoderma applanatum (*Pers.*) *Pat.* Hymen. d'Europe, p. 143.
On an old stump, Kaimosi, Nyanza Province, 1925, *McDonald*.

Fomes senex (*Nees et Mont.*) *Fr.* Nov. Symb. p. 66.
Coastal belt, *Maitland*.

Fomes pseudosenex (*Murr.*) *Sacc. & Trott.* Syll. xxi, p. 292.
On a dead stump, Gongoni Forest, Witu, *Maitland* 581.

Fomes badius (*Berk.*) *Cke.* in Grev. xiv, 1885, p. 18.
On a dead erect stump in the open, Mazeras, June, *Maitland* 543.

Fomes yucatanensis (*Murr.*) *Sacc. & D. Sacc.* Syll. xvii, p. 116.
On a dying Olive, Solai Valley, 7000 ft., Nov., *McDonald* 9.

Fomes rimosus (*Berk.*) *Fr.* Nov. Symb. p. 66.
On dead or living trees, Mazeras Forest, *Maitland*.

Fomes juniperinus (*Schrenk*) *Sacc. & Syd.* Syll. xvi, p. 151.
On *Juniperus procera* causing rot, Aberdare Range, Kikuyu, and Mau Escarpments of Rift Valley, and N.W. slopes of Mt. Kenya, *Dowson* 176.

This fungus is responsible for causing the most serious disease of forest trees in East Africa (Dowson in Wakefield, *Kew. Bull.* 1915, p. 102).

Polystictus incomptus *Fr.* Epicr. p. 437.
On branches buried in leaf debris, Mazeras Forest, June, *Maitland* 535; Rabai Hills, Mombasa, *Rev. W. E. Taylor*.

Polystictus xanthopus *Fr.* Nov. Symb. p. 74.
Abundant in damp forest behind Kau; frequent in all parts of the Coast except Mombasa area, where strangely it was not collected, *Maitland* 532.

Polystictus sanguineus *Fr.* Nov. Symb. p. 75.
On fallen trunks and stumps near coast, *Dowson* 179; *Maitland* 545; Sabakhi Valley, E. of Makangeni, Aug., *Gregory*.

Polystictus elongatus (*Berk.*) *Cke.* in Grev. xiv, 1886, p. 80.
Kibwezi, *Gregory*.

Polystictus funalis *Fr.* Epicr. p. 459.
On old stumps in rice fields, Kau, Witu, Sept., *Maitland* 538.

Polystictus chrysites (*Berk.*) *Cke.* in Grevillea xiv, 1886, p. 82.
Guan Narok, June, *Gregory*.

Polystictus floccosus *Jungh.* Fl. Crypt. Jav. p. 49.
On rotten stumps and logs in Rice fields, Kau, Witu; on dead tree trunk, Ribi, near Mazeras, Sept., *Maitland* 510; on a mangrove pole lying in a yard, Lamu, Sept., *Maitland* 547.

Polystictus versicolor (*Linn.*) *Fr.* Nov. Symb. p. 86.
On fallen trunks and stumps near the Coast, *Dowson* 178, 182; on the south of south spur of Yatta, *Gregory*.

Polystictus hirsutus *Fr.* Nov. Symb. p. 86.
Nandi, 6000 ft., on logs, *Scott Elliot* 86; Athi Plains, 5000–6000 ft., on dead logs, *Scott Elliot* 34 and 35.

Polystictus velutinus *Fr.* Syst. Myc. i, p. 368.
Ngomeni, *Gregory*.

Polystictus occidentalis (*Kl.*) *Fr.* Nov. Symb. p. 90.
On fallen trunks near the coast, *Dowson* 173; on a prostrate log, Mazeras, July, *Maitland* 540. This is a common fungus along the coast.

Polystictus rigens *Sacc. & Cub.* Syll. vi, p. 274.
Trametes rigida Berk. & Mont. in Ann. sc. nat. sér. 3, xi, 1849, p. 240.
On stout dead branches, Gongoni Forest, Witu, Sept., *Maitland* 525.

Polystictus byrsinus (*Mont.*) *Cke.* in Grev. xiv, 1886, p. 85.
On a well-decayed log, Gongoni Forest, Witu, Sept., *Maitland* 544.

Polystictus luteo-olivaceus *Berk. & Br.* in Trans. Linn. Soc. ser. 2, i, 1880, p. 402.
Nairobi, *Dowson* 527.

Polystictus caperatus (*Berk.*) *Fr.* Nov. Symb. p. 92.
On a dead log, Gongoni Forest, Witu, Sept., *Maitland* 514.

Polystictus Gregorii *A. L. Smith*, Journ. of Bot. xxxiii, 1895, p. 341.
Mangea, *Gregory*.

Trametes corrugata (*Pers.*) *Bres.* in Hedwigia li, 1912, p. 316.
On dead logs, Gongoni Forest, Witu, *Maitland*.

Trametes cingulata *Berk.* in Hook. Journ. Bot. 1854, p. 164.
On a prostrate log lying 5 ft. or more above high tide mark, Lamu, Sept., *Maitland* 512.

Trametes Sprucei *Berk.* in Hook. Lond. Journ. Bot. viii, 1856, p. 236.
Woods around Ngatana, *Gregory*.

Trametes floccosa *Bres.* in Ann. R. Ist. Bot. Roma, vi, 1896, p. 179.
On decayed tree stumps, fungus growing at ground level, Ribi, Mazeras, also Witu, Jan., *Maitland* 565.

Trametes versatilis *Berk.* in Hook. Lond. Journ. Bot. i, 1842, p. 150.
In woods S.E. of Mangea, *Gregory*; on the side of a prostrate coconut palm, Mazeras, July, *Maitland* 550; on a decayed prostrate coconut trunk, Chamgamwi, near Mombasa, Jan., *Maitland* 554; on a decayed telegraph support, Nairobi, Feb., *Maitland* 558.

Trametes hydnoides (*Sw.*) *Fr.* Epicr. p. 490.
Rabai Hills, Mombasa, *Rev. W. E. Taylor*; on stumps, Kau, Kilifi, Mazeras, Rabai Hills, Mombasa, *Maitland* 511.

Trametes incerta (*Curr.*) *Cke.* in Grevillea xv, 1886, p. 56.
On a dead erect tree trunk near high tide level, Nkunumbi Creek, Witu, April, *Maitland* 553.

Currey's original specimen from Burma was largely resupinate with only a small reflexed margin. Large bracket-shaped forms have since been received from India. The present collection has a large number of imbricated small pilei, connected by resupinate portions, and the pores tend to be more daedaleoid than in the Indian gatherings, but there is no doubt that the plant belongs to the same species.

It is allied to *Daedalea Sprucei* and *Daedalea fusco-stratosa* of South America, which are somewhat darker in colour. All these forms are characterised by the dull brownish colour of flesh and pores, and by possessing small slightly coloured fusiform cystidia, 20–25 x 6–7 μ, which when young are capped by a small deposit of crystals.

Hexagonia Pobeguini *Har.* in Bull. Soc. Myc. Fr. viii, 1892, p. 28.
On a prostrate tree trunk, Mazeras Forest, Jan., *Maitland* 533, 550.

Hexagonia sericata *Wakef.* in Kew Bull. 1922, p. 161.
On dead wood, Nairobi, *Maitland* 534.

Hexagonia subvelutina *Wakef.* in Kew Bull. 1917, p. 310.
On wood, *Dowson* 530.

Favolus Rhipidium (*Berk.*) *Cke.* in Grev. xv, 1886, p. 58.
Upper forest zone, Mt. Kenya, *Gregory*.

Favolus multiplex *Lév.* in Ann. sci. nat. sér. 3, ii, 1844, p. 203.
Nairobi, *Dowson* 528.

Hydnaceae.

Irpex flavus *Kl.* in Linnaea viii, 1833, p. 488.
On a fallen branch, Gongoni Forest, Sept., *Maitland* 526; on a charred log in the open, Mazeras, April, *Maitland* 551.

Thelephoraceae.

Stereum Thozetii *Berk.* in Journ. Linn. Soc. xviii, 1881, p. 385.
Growing amongst sand on a road, Witu, May, *Maitland* 530.

The type species of *S. Thozetii* comes from Australia, but these Kenya specimens agree well with it in their macroscopic characters as well as in their thick walled hyphae, abundant gloeocystidia and in the shape of the spores. The latter are however slightly larger, being 7–8 x 5 μ here, and in the type 5–7 x 5 μ.

Stereum fasciatum (*Schw.*) *Fr.* Epicr. p. 546.
On an old log, Gongoni Forest, Witu, Sept., *Maitland* 520.

Stereum hirsutum (*Willd.*) *Fr.* Epicr. p. 549.
Woods round Ngatana, Jan., *Gregory*; Rengatan, Ndari, Leikipia, June, *Gregory*.

Stereum lobatum *Fr.* Epicr. p. 547.
Hohnel Valley, Sabakhi Valley, Guan Narok, *Gregory*.

Stereum Schomburgkii *Berk.* in Journ. Linn. Soc. xiii, 1873, p. 168.
On the under sides of fallen logs, Gongoni Forest, etc., Sept., *Maitland* 542.

Hymenochaete luteo-badia (*Fr.*) *Wakef.* in Kew Bull. 1917, p. 13.
Mombasa, *Maitland* 516.

Hymenochaete tristicula (*B. & Br.*) *Mass.* in Journ. Linn. Soc. xxvii, 1890, p. 111.
Coastal belt, *Maitland*.

Hymenochaete corrugata (*Fr.*) *Lév.* in Ann. sci. nat. sér. 3, v, 1846, p. 152.
On a dead log, Gongoni Forest, Witu, Sept., *Maitland* 515.

This specimen is very much thicker than the European specimens, but its structure is similar to the latter. No spores were found.

Hymenochaete semistupposa *Petch* in Ann. R. Bot. Gard. Perad. ix, 1925, p. 278.
On fallen branches, Gongoni Forest, Sept., *Maitland* 517.

The setae in this specimen are slightly shorter than those in Petch's type, but otherwise the colour and structure are exactly similar.

Corticium salmonicolor *B. & Br.* in Journ. Linn. Soc. xiv, 1875, p. 71.
On leaves and twigs of Coffee, Dec. 1923, Mar. 1924, *McDonald*.

Corticium salmonicolor is normally a species which grows on bark, but in these specimens it was found to be epiphytic on leaves. In the second of the two gatherings the transition from the normal to the abnormal habitat, *i.e.* from the twig to the leaf blade, is well illustrated. On the leaf basidia were found to be numerous, but no spores were seen.

Cyphella villosa (*Pers.*) *Karst.* Myc. Fenn. p. 325.
On a twig of *Sesbania* sp., Kaimosi, Nyanza Province, *McDonald*.

Tremellaceae.

Auricularia polytricha (*Mont.*) *Sacc.* Misc. i, p. 12, in Atti d. R. Istit. Ven. di Sci. ser. 6, ii, 1884.
On decayed logs, Witu and Kau, Sept., *Maitland* 541.

Auricularia Auricula-Judae (*Linn.*) *Schroet.* in Cohn. Krypt. Fl. Schles. iii, i, p. 386.
Kibwezi, *Gregory*.

Gasteromycetes.

Podaxon loandensis *Welw. & Curr.* in Trans. Linn. Soc. Lond. xxvi, 1867, p. 288.

In sand on a piece of cleared litoral, Mombasa, *Dowson* 183; *Maitland* 531.

Podaxon sp. (*loandensis* ?) is common in the Sudan, and according to Mr. R. E. Massey the spores are used by the natives to obtain a yellowish dye for carpets.

Lasiosphaera Fenzlii *Reich.* in Fenzl, Reise der Fragatte Novara, Bot. Theil i, 1870, p. 135.
On the ground in forest nursery, Rongai Forest, Nov., *McDonald* 11.

These specimens are scarcely mature. The gleba is alutaceous-olivaceous in colour instead of purplish umber.

McDonald states that according to the forester " the dried fungi are used by the natives to fumigate their huts. The fungi are thrown on the fire, after which the natives vacate the huts for the time being, owing to the injurious effects of the fumes on the eyes."

UREDINEAE.

Uromyces Fabae (*Pers.*) *De By.* in Ann. sci. nat. sér. 4, xx, 1863, p. 80.
Uredo on " Egyptian Bean " and " Broad Bean," *A. Linton* 141; on *Vicia Faba* leaves, 26th Sept. 1916, *Dowson.*

Uromyces appendiculatus (*Pers.*) *Link,* Obs. ii, 1809, p. 28.
On *Phaseolus* sp., *Dowson.*

Uromyces striatus *Schroet.* in Abhandl. Schles. Ges. 1869, p. 11.
On cultivated Lucerne, Nairobi, *A. Linton* 229; on cultivated Lucerne, Limoru, Feb., *Dummer* 1742.

Uromyces Ixiae (*Lév.*) *Wint.* in Flora xlii, 1884, p. 262.
On leaves of *Acidanthera bicolor* Hochst. Gilgil and Elmenteita, 5000–6000 ft., *Battiscombe* 1219.

Uromyces pustulatus *Wakef.* in Kew Bull. 1922, p. 163.
On leaves, inflorescences and fruits of *Bauhinia fassoglensis* Kotschy, Kibos, Mombasa, Feb. 1921, *Maitland.*

Uromyces Setariae-italicae (*Diet.*) *Yoshino* in Bot. Mag. Tokyo, xx, 1906, p. 247.
On *Setaria verticillata,* Oct. 1916, *Dowson.*

Kuehneola Fici (*Cast.*) *Butl.* in Ann. Myc. xii, 1914, p. 79.
Uredo-stage on cultivated fig, Nairobi, *A. Linton* 230.

Hemileia vastatrix *B. & Br.* in Gard. Chron. 1869, p. 1157.
On leaves of Coffee, *Dowson.*

Dowson in the Ann. Rept. Dept. Agric. Kenya 1919–20, p. 80, states that in Kenya, Coffee leaf disease, which is caused by this fungus, has become so widespread that towards the end of the long rains it is to be found on almost every plantation. The damage caused by this disease seems to depend largely on the altitude of the plantations and their state of cultivation.

Melampsorella (?) **Ricini** (*Biv.*) *de Toni* in Sacc. Syll. vii, p. 596.
On leaves of *Ricinus communis,* 26th Sept. 1916, *Dowson.*

Puccinia Asparagi *DC.* Flor. Fr. ii, p. 595.
Aecidium only on leaves of Asparagus, Mt. Ndei, *Scott Elliot* 23.

Puccinia Menthae *Pers.* Syn. p. 227.
On Labiatae, Limoru, Feb. 1915, *Dummer* 1748.

Puccinia graminis *Pers.* Disp. Meth. Fung. 1797, p. 40, and Syn. 1801, p. 228.
Uredo on Wheat, 1905, *A. Linton*; on wheat and oats, chiefly at Machakos, W. Kenya, Njoro and Uasin Gishu Plateau, 1916, *Dowson.*

P. graminis and *P. glumarum* are the two dangerous rusts in the country.

Puccinia Sorghi *Schw.* Syn. N. Amer. Fungi in Trans. Amer. Phil. Soc. Philad. N.S. iv, 1834, p. 295.
Uredo on Maize, 1905, *A. Linton.*

Puccinia aliena *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 259.
On leaves of *Alchemilla* sp., 26th Sept. 1916, *Dowson.*

On these leaves there are also present uredosori, hypophyllous, radially arranged, confluent, pale yellow; spores globose or subglobose, echinulate, yellowish, 17–22 μ diam. These may be the uredosori of the Puccinia, but seem to answer also to the description of *Uromyces alchemillae* Lév.

Puccinia Erlangeae *Grove* in Kew Bull. 1916, p. 270.
On leaves of *Erlangea tomentosa*, Nairobi, Limoru, Feb., *Dummer* 1745.

"Belongs to type of *P. Hieracii*, but is remarkable for its very thin wall." (Grove loc. cit.)

Puccinia glumarum (*Schm.*) *Eriks. & Henn.* Die Getreideroste, 1896, p. 141.
Yellow rust of wheat.
Wheat attacked severely at Njoro, Solai Escarpment and Keringet, *Dowson.*

Puccinia haematites *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 260.
On leaves of *Triaspis auriculata*, Kibwezi, June, *Scheffler* 4.

Puccinia leonotidicola *P. Henn.* in Bot. Ergeb. der Kunene-Sambesi Exped. 1902, p. 3.
Uredo stage only on leaves of *Leonotis* sp., 23rd July 1915, Kabiti Road., *Dowson*; 26th Sept. 1916, *Dowson.*

Puccinia Pruni-Persicae *Hori* in Phytopathology ii, 1912, p. 144.
Uredo stage, on leaves of *Prunus Persica*, *Dowson.*

Puccinia triticina *Eriks.* in Ann. sci. nat. sér. 8, ix, 1899, p. 270.
On wheat in all parts of the country, *Dowson.*

Aecidium Crotalariae *P. Henn.* in Engler Pflanzenwelt Ostafr. 1895, p. 52.
Nandi, 6000 ft., *Scott Elliot* 87.

Aecidium Solani-unguiculati *P. Henn.* in Bull. Herb. Boiss. i, 1893, p. 112.
On *Solanum* sp., *McDonald.*

Aecidium ugandense *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 262.
On leaves of *Turraea* sp., Kibwezi, 3300 ft., Sept., *Scheffler* 182a.

Uredo Ciceris-arietini (*Grogn.*) *Jacz. et Boy* in Ann. Ecole Nat. Agr. Montpellier, 1894, p. 195.
Nairobi, *A. Linton* 139.

Uredo Dioscoreae *P. Henn.* in Hedwigia xxxv, 1896, p. 255.
On leaves of *Dioscorea* sp., Kyambu, *Dowson* 9.

Uredo Scheffleri *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 262.
On leaves of *Capparis* sp., or *Maerua* sp., Kibwezi, June 1906, *Scheffler*.

According to Sydow (loc. cit.) this Uredo probably belongs to a Hemileia.

Caeoma Clematidis *Thm.* Myc. Univers. No. 539.
On leaves of *Clematis* sp., Limoru, 7000 ft., Feb., *Dummer* 1743.

Ustilaginaceae.

Ustilago Cynodontis (*P. Henn.*) *Bref.* Unters. xii, p. 105.
On *Cynodon*, *McDonald*.

Ustilago goniospora *Massee* in Kew Bull. 1899, p. 183.
In ovaries of an undetermined *Aristida*, Ukamba, *Scott Elliot* 6491.

Ustilago heterospora *P. Henn.* in Engl. Pflanzenwelt Ostafr. 1895, p. 48.
On *Panicum maximum* Jacq., Wanga, S. Kavirondo, 4000 ft., *Lathbury*.

Sphacelotheca Sorghi (*Lk.*) *Clinton* in Journ. Myc. viii, 1902, p. 140.
On *Andropogon Sorghum*, Scott Agric. Lab. plot, 1924, *McDonald*.

Sphacelotheca Themedae *Duke* sp. nov.

Sori in ovariis evoluti, elongati, circ. 15 mm. longi, membrana pallida, apice dehiscente, circumdati. Cellulae steriles, leviter brunneae, laxe adhaerentes quoad formam valde mutabiles. Massa sporarum nigra, pulverulenta. *Sporae* globosae vel oblongae, verruculosae, leviter olivaceo-brunneae, 10–13 x 7–10 μ.

Hab. in ovaries of *Themeda triandra*, Nairobi, Kenya, 14th May 1916, *Dowson*.

Tolyposporium Penicillariae *Bref.* Unters. xii, p. 154.
On inflorescence of *Pennisetum typhoideum*, *Dowson* 3.

Sorosporium Reilianum (*Kuehm.*) *McAlp.* Smuts Austral. p. 181.
On *Sorghum caudatum* and *Zea Mays*, *McDonald*.

Cerebella Cynodontis *Syd.* in Ann. Myc. x, 1912, p. 45.
On *Digitaria* sp., Limoru, 7000 ft., Feb., *Dummer* 1740; on *Digitaria nitens*, 1916, *Dowson*; on *Cynodon dactylon*, *McDonald*.

Cerebella Sorghi-vulgaris *Subramaniam* in Journ. & Proc. Asiatic Soc. Bengal N.S. xvii, 1921, p. 206.
On Kaffir corn at Kabete Experimental Farm, 1923, *McDonald*.

PYRENOMYCETES.

Asterina Combreti *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 264.
On leaves of *Combretum tavatense* Engl., Kibwezi, June, *Scheffler*.

Parodiella perisporioides *Speg.* in Anal. Soc. Cient. Argentina, ix, 1880, p. 178.
On leaves of Leguminosae, 26th Sept. 1916, *Dowson*.

Physalospora Cydoneae *Arnaud* in Ann. Ecole Nat. Agr. Montpellier xii, 1912, p. 9.
Apple canker (conidial stage, *Sphaeropsis malorum* Pk., only), *Dowson*.

Glomerella Psidii (*Del.*) *Shel.* in W. Virginia Univ. Agr. Exp. St. Bull. 104, 1906, p. 311.
On guava causing fruit scab, *McDonald*.

Xylaria allantoidea *Berk.* in Journ. Linn. Soc. x, 1869, p. 341.
On a well-decayed log, Gongoni Forest, Witu, Sept., *Maitland* 528.

Xylaria arbuscula *Sacc.* in Michelia i, 1878, p. 240.
On pods of an unknown Legume partly or entirely buried in leaf debris, Mazeras Forest, *Maitland* 570.

Spores 11–12 x 5–6 μ, rather smaller than normally.

Xylaria ianthino-velutina *Mont.* in Ann. sci. nat. sér. 2, xiii, 1840, p. 348.
Mazeras Forest, on thick woody pods of *Afzelia cuanzensis*, *Maitland*.

Xylaria nigripes (*Kl.*) *Sacc.* Syll. ix, p. 527.
On low ant-hills, Mazeras, March and April, *Maitland* 503.

The following details were given in a note by Maitland accompanying the specimens. The conidia-bearing clubs appear first while the ascigerous forms follow 10–14 days later. Normally the conidial and perfect stages are produced on separate clubs, but in some cases asci may be developed on a conidial structure. The fungus was collected from old ant-hills. No sclerotia were found, but rhizomorphic strands were traced back to the galleries of the ant-hills. These strands crumbled up on handling as if their substance and vitality had been used up by the production of the fruiting bodies.

Ustulina zonata (*Lév.*) *Sacc.* Syll. i, p. 352.
On roots of peach and pear trees growing on old forest land, causing death, *McDonald*.

This fungus is more commonly found causing a root disease of tea, coffee, rubber, on similar land.

Daldinia Eschscholtzii (*Ehrenb.*) *Rehm.* in Ann. Myc. ii, 1904, p. 175.

On partially decayed fallen trees, Gongoni Forest, Witu, *Maitland* 523.
Very common throughout Tanaland.

Daldinia concentrica *Ces. & De Not.* in Comm. Soc. Critt. It. No. 4, 1863, p. 198.
On fallen trunks near the coast, *Dowson* 175.

Hypoxylon annulatum (*Schw.*) *Mont.* in Gay, Hist. de Chile, Bot. vii, 1850, p. 445.
On an old decayed log, Gongoni Forest, Witu, Sept., *Maitland* 521.

Mycosphaerella Stephanorossiae *Duke* sp. nov.

Perithecia gregaria, hypophylla, immersa, nigra, globosa, minuta 120–140 μ diam. *Asci* aparaphysati, clavati, breviter stipitati, 57–70 x 15–23 μ. *Sporidia* 8, subfusoidea, utrinque subacuta, recta vel parum curvata, ad septum vix constricta, circ. 30 x 6 μ.

Hab. in foliis *Stephanorossiae* sp., Limoru, Kenya, Feb. 1915, *Dummer* 1749.

Engleromyces Goetzei *P. Henn.* in Engl. Bot. Jahrb. xxviii, 1900, p. 327.
Dowson 343; on Bamboo, N. Kenya, 10,000 ft., 20th July 1920, *J. Youngson*; on Bamboo, 9,500 ft., *P. Bonfield*.

According to the last-named collector, this fungus is not at all widespread and is much sought by the natives as a stomach medicine.

Nectria Rickii *Rehm.* in Hedwigia xliv, 1904, p. 2.
On bark of tree trunk, Gongoni Forest, Witu, Sept., *Maitland* 580.

Nectria striatospora *A. Zimm.* in Centralbl. f. Bact. vii, 1901, p. 105.
On dead wood, Gongoni Forest, Witu, *Maitland* 529.

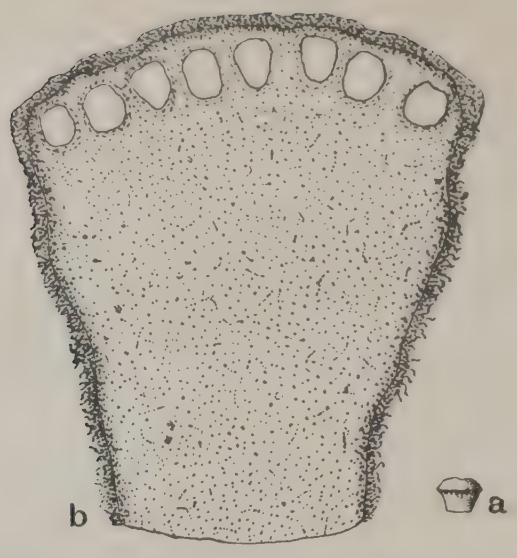
According to von Höhnel and Weese (Ann. Myc. ix, 1911, p. 423) *Nectria striatospora* Zimm. is the same as *Nectria discophora* Mont.

Hypocrea brachycaulis *Duke* sp. nov.

Stroma parvum erectum, discoideo-turbinatum, brevissime stipitatum usque ad 2 mm. alt. Discus convexus circularis rugosus, pallide brunneus, politus, 2.5 mm. diam. Stipes fusco-olivaceus, supra pallidus, leviter flocculosus. *Perithecia* immersa, globosa vel ovata, circ. 210 x 180 μ ostiolis 60–80 μ longis. *Asci* aparaphysati cylindrici, 8 sporis (simulate 16 sporis) 60–75 x 3–4 μ. *Sporidia* monosticha, e duobus cellulis aequilibus mox separatis composita. Articuli sporidiorum hyalini, globosi vel oblongi, 2–2.5 μ long. diam.

On tree trunks, Gongoni Forest, Witu, Kenya, Sept., *Maitland* 536.

In form and size this species is very similar to *Hypocrea turbinata* Starb. (in Ark. f. Bot. v, 7, 1905, p. 11, fig. 7 a–c) of Brazil but differs from it in the much smaller hyaline spores.



Hypocrea brachycaulis Duke sp. nov.
a. Stroma × 2. b. Long. sect. stroma × 27.

Phyllachora graminis (*Pers.*) *Fuck.* Symb. Myc. p. 216.
Mt. Kenya, *Gregory*.

Phyllachora Tricholaenae *P. Henn.* in Engl. Bot. Jahrb. xxiii, 1897, p. 541.
On leaves of *Tricholaena rosea* Nees, Embu District, 3,300 ft., 1925, *F. B. Butler* 102.

Corynelia uberata *Fr.* Syst. Myc. ii, p. 535.
On leaves of Podocarpus, 26th Sept. 1916, *Dowson*.

Phycomycetes.

Cystopus candidus *de Bary* in Ann. sci. nat. sér., 4, xx, 1863, pp. 31, 130.
On seed of *Diplotaxis* sp., *Dowson*.

Fungi Imperfecti.

Phoma Euphorbiae *Sacc.* Mich. ii, p. 339.
On stem of Tragia, Mbuyuni, *Scott Elliot* 6200.

Phomopsis Lobeliae (*B. & Br.*) *Petch* in Ann. Bot. Gard. Perad. vii, 1919, p. 36.
On Tree Lobelia, Limoru, 7,000 ft., Feb., *Dummer* 1750.

Botryodiplodia Theobromae *Pat.* in Bull. Soc. Myc. Fr. viii, 1892, p. 136.
On roots of diseased Apple trees, Thika, 1924, *McDonald*.

Septoria Petroselini *Desm.* var. **Apii** *Br. & Cav.* Fungh. Parass. No. 144, 1890.
Causing late Blight of Celery, *McDonald*.

Septoria Lycopersici *Speg.* F. Argent. iv, No. 289.
Leaf spot of tomatoes, *McDonald*.

Asterostomella africana *Syd.* in Engl. Bot. Jahrb. xlv, 1910, p. 264.
On leaves of *Thylachium africanum* Lour., Kibwezi, June 1906, *Scheffler*.

Probably connected with an *Asterina* (Engl. loc. cit.).

Leptostromella septorioides *Sacc. & Roum.* Mich. ii, p. 632.
On leaves of *Eragrostis* sp., Embu District, 6,000 ft., *F. B. Butler* 154.

Gloeosporium rufomaculans (*Berk.*) *Thum.* Fungi pomic. p. 61.
Bitter rot of Quince, *McDonald*.

Gloeosporium coffeanum *Delacr.* Bull. Soc. Myc. Fr. xiii, 1897, p. 110.
Leaf blotch of coffee, *Dowson*.

Colletotrichum Lindemuthianum (*Sacc. & Magn.*) *Brios. & Cav.* Fungh. Parass. No. 50.
Nairobi, *A. Linton* 142.

Colletotrichum Agaves *Cav.* in Hedwigia xxxi, 1892, p. 315.
On Sisal Hemp (*Agave rigida* var. *sisalana*), ring spot disease recorded only in very wet rainy seasons, *Dowson*.

Colletotrichum coffeanum *Noack* in Zeitschr. f. Pflanzenkr. xi, 1901, p. 202.
On coffee berries, *McDonald*.

This fungus has now been definitely proved to be the causal organism of the coffee berry disease. It seems, however, to be a different strain from that which commonly attacks the twigs and leaves of coffee bushes in Kenya but which does little harm. (McDonald in Trop. Agric. lxiv, 1925, p. 163, reprinted from Farmers' Journ. vii, p. 1).

Polyspora Lini *Lafferty* in Sc. Proc. R. Dublin Soc. N.S. xvi, 1921, p. 258.
On flax crops—Browning's Disease, *McDonald*.

Septogloeum Mori (*Lév.*) *Brios. & Cav.* Fungh. Parass. No. 21, 1888.
Causing a leaf spot of Mulberry, *Dowson*.

Pestalozzia uvicola *Speg.* in Thum. Pilze des Weinstockes, p. 13.
On Grape vines, *Dowson*.

Pestalozzia palmarum *Cke.* in Grev. iv, 1876, p. 115.
On the leaves and nuts of Coconut palm, *McDonald*.

Pestalozzia Theae *Sawada* in Spec. Rep. Agr. Exp. Sta. Formosa 1915, No. 11, p. 113.
Grey blight of tea, *McDonald*.

Piricularia grisea (*Cke.*) *Sacc.* Mich. ii, p. 148.
On Rice—Rice Blast, *McDonald.*

Cladosporium herbarum (*Pers.*) *Link.* Obs. Myc. ii, p. 37.
On leaves of *Cluytia richardiana* Muell. Arg., Ukamba, *Scott Elliot* 2334; on leaves and stems of unnamed host, 7,000 ft., Limoru, Feb., *Dummer* 1741.

Cercospora coffeicola *B. & Cke.* in Grevillea ix, 1881, p. 99.
Leaf spot disease of Coffee, *Dowson*; *McDonald.*

Cercospora Nicotianae *E. & E.* in Proc. Acad. Nat. Sc. Philad. 1893, p. 170.
Leaf spot of Tobacco, 1924, *McDonald.*

Helminthosporium turcicum *Pass.* in Bull. Comiz. Agr. Parm. Ott. No. 10, 1876.
Maize leaf blight, *McDonald.*

Fusarium heterosporum *Nees* in Nov. Act. Acad. Caes. Leop. ix, 1818, p. 235.
On *Setaria* and *Cynodon*, Njoro, Sept., *Dowson* 339, 340.

Fusarium Limonis *Briozi* in Atti Staz. Chim. Agrar. Roma, 1878.
On Citrus trees, *Dowson.*

The disease known as "Foot rot" of Citrus trees is usually ascribed to this fungus, but Dowson thinks that it is more probably due to bacterial attacks in the first place, and the *Fusarium* is secondary. Whatever the initial cause, the disease is the most serious of those attacking the Citrus tree in Kenya (Dowson in Ann. App. Biol. viii. 1921, p. 83).

Fusarium Zeae (*West.*) *Sacc.* Syll. iv, p. 713.
On leaves of *Zea Mays*, Gosha, Jubaland, *H. Powell* 10.

Fusarium culmorum (*W. Sm.*) *Sacc.* Syll. xi, p. 651.
"Red Mould" of wheat, only a few isolated cases, Kericho, *McDonald.*

Fusarium Lini *Boll.* in Bull. N. Dakota Agr. Exp. St. No. 50, 1901, p. 37.
On Flax causing Wilt disease, Kericho, *Dowson*; *McDonald.*

Sterile Mycelia.

Rhizoctonia lamellifera *Small* in Trans. Brit. Myc. Soc. ix, 1924, p. 165.
On roots of Kenya coffee, forming disease, *McDonald.*

Schizomycetes.

Bacterium tumifaciens *Smith & Townsend* in Science N.S. xxv, 1907, p. 672.
Crown Gall of Almond, *McDonald.*

PLATE VIII.

Cornus Kousa.

[*To face page* 320

PLATE IX.

Aesculus indica.

To face page 321

XXXIX. GARDEN NOTES ON NEW OR RARE TREES OR SHRUBS. W. J. Bean.

Cornus Kousa *Buerg.* var. **chinensis** [Cornaceae].

In the *Kew Bulletin* for 1915, page 177, an illustrated article on *Cornus Nuttallii* and its allies appeared. Besides a picture of a wonderful specimen of *C. Nuttallii* in full blossom in British Columbia, an illustration of a flowering spray of *C. Kousa* was given. This represents the form commonly cultivated which, many years ago, was introduced from Japan. In 1910 two small trees were obtained from the Arnold Arboretum which had been raised from seeds sent there by Mr. E. H. Wilson. These are now 10 feet high and have flowered very beautifully during the last six or eight years. They represent a much finer form than the original one obtained from Japan in having considerably larger bracts. There are in fact few shrubs or small trees so beautiful flowering in June and July.

Mr. E. H. Wilson, who found it to be abundant in Western Hupeh to the north and south of Ichang at 4000 to 7000 feet altitude, describes it as a bush, or flat-topped small tree, up to 30 feet high. Its leaves are deciduous, ovate to suborbicular and up to 4 inches long. The floral bracts, four in number, are narrowly ovate, each tapering to an acuminate point, 2 to $3\frac{1}{2}$ inches long, $\frac{3}{4}$ to $1\frac{1}{4}$ inches wide; at first green they gradually lose this colour as they increase in size until they are finally a slightly creamy white. They stand erect from the horizontal branches so close that in places they make an unbroken sheet of blossom.

This cornel is evidently very hardy, as it thrives splendidly in the Arnold Arboretum, where the winter cold is much more severe than ours. In a recent Bulletin of that institution Prof. Sargent writes, "it is doubtful if a more beautiful plant has ever come from Eastern Asia to the Eastern United States."

Aesculus indica *Colebr.* [Sapindaceae].

It may safely be said that no large flowering tree has been so undeservedly neglected in English gardens as the Indian horse chestnut, *Aesculus indica* Colebrooke. It seems first to have been introduced in 1851, by means of seeds sent from India by Sir Charles J. F. Bunbury to Barton Place in Suffolk. A tree raised from this sending was measured by the late Mr. Elwes at Barton in 1904, and it was then 66 feet high, its trunk 7 feet 2 inches in girth. This tree appears to have been the finest of its kind ever grown in this country and, judging by an illustration of it that appeared in the Gardeners' Chronicle for Sept. 17th, 1904, it was of shapely form and luxuriant in growth at that time, with very much the contours of the common horse chestnut. We learn, however, from Mr. R. C. Notcutt, of Woodbridge, that when the old house at Barton was burnt down a few years later, the estate was sold and all the timber, including the

Aesculus indica, was cut down. When Mr. Notcutt saw the stump last autumn it was sending up shoots all round the sides.

Of the trees existing at Kew the oldest was received in 1887, from Mr. Lavallée, whose Arboretum at Segrez in France was then one of the most famous in Europe. In 1889 seeds were received from Saharunpore from which plants were raised, and in 1890 Lord Ducie sent a plant. The best tree at Kew is the one from Mr. Lavallée; this is now 27 feet high and 3 feet 6 inches in girth of trunk. Considering its age it ought to have been considerably larger, but it was, unfortunately, planted in some of the poorest and most arid soil in the place. It is, nevertheless, now growing well and flowers freely every year; it may indeed, safely be described as the handsomest of large trees at Kew blossoming in late June.

It is curious considering the close relationship that has existed since 1841 between Kew and India, that it was not introduced earlier. But the people over there never seemed to realize the importance of sending the seeds as soon as they were ripe and packing them in slightly moist material. It is fatal to seeds of this (as well as of other horse chestnuts) to keep them dry for long. However, there need now be no concern about the establishment of this noble tree in the British Isles. The specimen at Kew just described produces almost every year a crop of seeds, sometimes very good crops. These as well as young plants have been freely distributed both to private and trade establishments in recent years. There seems to be no reason why the Indian horse chestnut should not, in a few years, be one of the most cherished of garden trees, or why (in the southern half of England at any rate) avenues should not be formed of it.

Perhaps its greatest recommendation is that it flowers four or five weeks (in the present year six weeks) later than the common one, by which time the great flowering period of hardy trees and shrubs has waned. Its foliage is handsomer, the individual leaflets are larger and of a rich glossy green, and its flower panicles are finer, being often 12 inches high and 4 to 5 inches wide. On young, very vigorous trees they have measured 16 inches high. The individual flower is about $1\frac{1}{4}$ inches wide with four white petals, the upper pair blotched with yellow and red at the base, the lower and larger pair suffused with pink. The whole tree, in foliage, panicle and individual flower, has greater distinction than the common species. It belongs to the *Pavia* section of the genus *Aesculus*, the fruits, although rather rough-surfaced, having no spines. The nuts are similar in colouring to those of common horse chestnut but usually smaller.

The tree attains enormous dimensions in North India, reaching 150 feet in height with a trunk 40 feet in girth. It occurs at elevations of 4,000 to 10,000 feet in the north-west Himalayas from the Indus to Nepal and has also been found in Afghanistan. It is very easily cultivated, its chief requirements being a rich moist loam. At

ew it succeeds in full sunshine. Owing to its rarity until recent ears no information appears to be available as to its suitability or the colder parts of the north of Britain, but it is not too rash erhaps to assume that it will succeed where the common species oes. It is at any rate well worth trying there.

XL.—ANGRAECOID ORCHIDS. K. W. Braid.

Few sub-groups of African Orchids are more bewildering than his section of the sub-tribe *Sarcantheae*. A superficial similarity of floral structures is associated with the greatest diversity of habit, size and floral modifications, and specimens discovered during the last few decades have rendered the old conceptions of the genera untenable.

Bentham and Hooker in the Genera Plantarum recognised 32 genera as belonging to the sub-tribe *Sarcantheae*, and of these four genera occurred in Africa. Rolfe* following the lines suggested by Reichenbach f. and Bentham separated *Saccolabium* (*Acampe*) from these four genera on account of the single slender stipe and gland, the short spur and wide lobes of the lip which are erect, distinct and broadly rounded. The three remaining genera *Angraecum*, *Listrostachys* and *Mystacidium* were regarded collectively as forming the Angraecoid orchids. Rolfe divided them on the structure of their pollinia, *Angraecum* possessing a single stipe and one gland and a different lip from *Saccolabium*, *Listrostachys* possessing two stipes to the pollinia but with both united to a single gland, and *Mystacidium* with each pollinium possessing its own stipe and gland. Round these arbitrary divisions during the last 25 years a heterogeneous collection of Angraecoids has been assembled. Most of them certainly have the structure of the pollinia in common, but, as many botanists did not adhere to this classification, the species do not even agree in this respect. Indeed, the degree of boiling to which dried flowers were subjected not infrequently led to confusion, since an apparently single stipe or gland might divide on further treatment, for, as Schlechter† has pointed out, two separate stipes are often held together by a fine membrane.

In 1907 Finet‡ published a valuable paper in which he divided the Angraecoids into two main sections according to whether the rostellum was produced into a point or indented. He raised the

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* Flora of Tropical Africa, vol. 7, p. 15.

† Schlechter, R. Versuch einer natürlichen Neuordnung der afrikanischen Angraekoiden Orchidaceen in Beihefte Bot. Centralb. Bd. xxxvi, 2, 1918 (pp. 62–181) p. 63.

‡ Finet, A. Classification et enumération des Orchidées africaines de la tribu des Sarcanthères d'après les collections du Muséum de Paris, in Bull. Soc. Bot. France liv, Mém. ix, 1907. (12 plates.)

number of genera to eleven and published some excellent plates which showed, among other things, what a heterogeneous collection of floral structures was to be found within this sub-tribe.

Dr. Schlechter studied the living Angraecoid orchids in Africa and other members of the sub-tribe in New Guinea and elsewhere. As a result he came to the conclusion that all the Angraecoid orchids should be placed under the single genus *Angraecum*, or that many new genera should be created. He chose the latter course. He could recognise *Mystacidium* in the restricted sense defined by Bolus, and he could appreciate the importance of Finet's classification, though in his view the genera were still far too heterogeneous. He accordingly increased the genera to 32, but on the whole they are clearly defined and quite natural.

Although Kew unfortunately does not possess specimens of all these genera, I have experienced no difficulty, where adequate material is present, in assigning any plant to its proper genus often without even dissecting the flowers. This is in striking contrast to previous experience with other keys, and I consider Schlechter's arrangement to be of the greatest value both to the grower, the field-worker in Africa and to the herbarium botanist.

The arrangement may be criticised because of the five monotypic genera. The advisability of making many genera when it was possible to sub-divide *Angraecum* itself is a matter of opinion. *Angraecum* with the 80 odd species recognised by Schlechter is not yet split up as fully as it probably will be, and the fact remains that hitherto the undoubtedly closely related species have not been brought together.

It would have been interesting had time permitted to have examined the structure of the rostellum and clinandrium of all the aphyllous species, for I feel that leaflessness is a feature which, being so apparent, is apt to receive more attention and carry more weight than is always justified. I am doubtful of its value as a character on which to base a genus. The definition also of *Cephalangraecum* in the Key hardly seems satisfactory, for no mention is there made of its deeply cleft although elongated rostellum.

Notwithstanding this, however, Dr. Schlechter's contribution is so valuable that a translation of his key to the genera is here appended.

In the paper itself Schlechter begins with a general discussion of the Angraecoid orchids, then gives his key and finally deals with each genus in turn. The species are enumerated alphabetically, and their localities, synonyms, and references are cited. Unfortunately there is no index co-ordinating the synonyms and specific names used with the new genera.

I have to acknowledge my thanks to the late Dr. Schlechter for his kindness in elucidating one or two portions of the key and for permission to publish the translation, and for calling attention to the fact that *Bathiea* is now *Neobathiea*.

Translation of Key.

1st Group.—Genera with Distinctly Elongated, if also at times Short Foot to Column.

Rostellum elongated; plate of lip completely united to spur:
Spur with narrow opening; plate of lip forming an angle with the opening of spur .....1. *Rhipidoglossum* Schltr. n. gen.
Spur with broad opening; plate of lip gradually merging into the spur:
Stem not distinctly elongated, leaves equitant (Iris-like) sword-like, pointed, flowers in shortened almost umbel-like bunches .....2. *Podangis* Schltr. n. gen.
Stems elongated with flat leaves, flowers in distinctly elongated bunches .....3. *Calyptrochilum* Kränzl.
Rostellum surrounded by a deeply jagged edge, plate of lip distinctly jointed on to the front of the free spur-opening
.....4. *Aeranthes* Lindl.

2nd Group.—Genera in which the Column Possesses no Extended Foot in Front.

1. Rostellum Distinctly Elongated.

Lip distinctly and broadly clawed with a perpendicular narrow spur-opening at some distance from the base
.....5. *Listrostachys* Rchb. f.
Lip not clawed, spur-opening directly at base of the lip close in front of the column:
Plants leafless; gynostegium generally ascending prominently behind the clinandrium, rostellum stretching downwards slantwise .....6. *Gussonea* A. Rich.
Plants leafy; gynostegium not distinctly ascending behind the clinandrium:
Plate of lip with distinct growths, callosities or numerous tubercles:
Spur with a narrow mouth placed sharply against the plate of lip:
Plate of lip with heart-shaped callus, spur standing out in front of the point with a geniculate bend
.....7. *Lemurorchis* Kränzl.
Plate of lip with a hump or horn-like outgrowth in front of the spur-opening, spur bent downwards
.....8. *Diaphananthe* Schltr.
Spur with wide opening, plate of lip with numerous small scattered tubercles .....9. *Beclardia* A. Rich.
Plate of lip smooth, without distinct growths, swellings or tubercles:
Plate of lip not or only indistinctly lobed:
Spur with narrow opening and placed sharply against the plate of lip:

Flowers small with a 2-flowered, very short, almost sessile inflorescence .....10. *Phormangis* Schltr. n. gen.
Flowers small, seldom 5 mm. in diameter, often with short cylindrical spurs, occasionally swollen towards the point but never filamentous; flowers in elongated bunches:
Rostellum fleshy, plate of lip slightly fiddle-shaped, spur bent gently backwards
.....11. *Sarcorhynchus* Schltr. n. gen.
Rostellum thin, not fleshy, plate of lip oval to broadly-oval, seldom lingulate (tongue-shaped):
Leaves equitant, sword-shaped; column of medium length, somewhat narrowed towards the top; spur bent forwards, rostellum ascending
.....12. *Bolusiella* Schltr. n. gen.
Leaves flat, column very short and uniformly thick, spur almost parallel with ovary; rostellum short, directed slantwise downwards
.....13. *Chamaeangis* Schltr. n. gen.
Flowers medium or large, about 1 cm. or more in diameter, spur reduced towards the point, generally threadlike:
Column short or only of moderate length, usually much shorter than half the length of the sepals, always flattened in front, in the under-part only semi-cylindrical:
Plate of lip at edge irregular, almost serrate, indistinctly 3-lobed, *i.e.*, with a long point standing out more sharply than usual
.....14. *Leptocentrum* Schltr.
Plate of lip perfectly entire, never indistinctly 3-lobed, often stumpy, seldom pointed
.....15. *Aerangis* Rchb. f.
Column strikingly slender and long, about 2·5 cm. long, in under part almost cylindrical
.....16. *Barombia* Schltr.
Spur with wide opening, plate of lip passing quite gradually into the spur:
Flowers in elongated bunches:
Rostellum deeply 3-fid; the side segments often finely papillose or very shortly ciliated
.....17. *Mystacidium* Lindl.
Rostellum undivided or bifid, always quite smooth (bare):
Stem always distinctly elongated, flowers somewhat firm in consistency:
Sepals, petals, and plate of lip all similar, more or less drawn out; spur reduced uniformly towards the point .....18. *Cyrtorchis* Schltr.

Sepals and petals stumpy, lip plate scarcely existent, only recognised as the boundary of the very widely opened spur; spur point vesicular .....19. *Solenangis* Schltr. n. gen.

Stems very much reduced, flowers fragile, spur broadly funnel-shaped with point doubled back .....20. *Eurychone* Schltr. n. gen.

Flowers in round heads [*Rostellum deeply 2-cleft although elongated, K. W. B.*] .....21. *Cephalangraecum* Schltr. n. gen.

Plate of lip distinctly 3-lobed or 3-partite (Occasionally, in the most simple tridactyle kinds, a side lobe is reduced to a little tooth on the edge of the lip):

Spur with wide opening, flowers in shortened, almost head-like, thickly flowered spikes .....22. *Ancistrorhynchus* Finet.

Spur with narrow opening:

Plants stemless or almost stemless, and with long and lanky-stalked inflorescence:

Side lobes of the labellum undivided, lip flat at base .....23. *Angraecopsis* Kränzl.

Side lobes of labellum deeply multi-cleft, lip in front of the spur-entrance with spherical shaped outgrowth .....24. *Crossangis* Schltr. n. gen.

Plants always with a distinctly elongated stem, inflorescences short and few-flowered or many flowered in crowded one-sided cluster covered with flowers almost to the base .....25. *Tridactyle* Schltr.

2. Rostellum Deeply Indented.

Lip perfectly spurless and without sack-like formation at the base .....26. *Bonniera* Cordem.

Lip with distinct sack or spur formation:

Lip united with the spur firmly and without articulation:

Lip undivided and pointed, more seldom shortly 3-lobed in front, and never distinctly 4-lobed, with anterior lobes large:

Lip contracted at the base, completely free from the column, mostly lanceolate-rhomboid, spur with narrow opening .....27. *Jumellea* Schltr.

Lip surrounding the column at the base, mostly mussel-shaped, boat-shaped, or horn-shaped with widened spur opening:

Lip surrounding the column only at the base, always open above, almost always undivided, or most rarely with short anterior lobes in front; usually mussel or boat-shaped .....28. *Angraecum* Bory.

Lip enveloping the whole column as in a horn, in front 3-lobed with two round, short side lobes and long linear pointed anterior lobes .....29. *Oeoniella* Schltr. n. gen.

Lip 4-lobed with two smaller posterior lobes lightly surrounding the column and much larger anterior lobes, more or less distinctly spread out like a fan:

Petals not clawed and not lobed

.....30. *Oeonia* Lindl.

Petals long with narrow claws and distinctly lobed-plates

.....31. *Cryptopus* Lindl.

Plate of lip distinctly jointed in front to the free spur-opening. Plate flat (shallow) deeply 3-lobed

.....32. *Neobathiea* Schltr. n. gen.

THE SECOND COLUMN GIVES THE MORE IMPORTANT NAME CHANGES ACCEPTED BY SCHLECHTER IN HIS REVISION OF THE AFRICAN ANGRAECOID ORCHIDS.

Aerangis Kotschyi Rchb. f.=*Aerangis Kotschyana.*
Aeranthes brachycentron Rgl.=*Aeranthes grandiflora* Ldl.
,, Perrieri Schltr.=*Neobathiea Perrieri.*
,, sesquipedalis Lindl.=*Angraecum sesquipedale* Thou.
,, vespertilis Cogn.=*Aeranthes ramosa* Cogn.
Aeranthus arachnanthus Rchb. f.=*Jumellea arachnantha.*
,, brachystachya Boyer=*Beclardia brachystachya* A. Rich.
,, calceolus S. Moore=*Angraecum calceolus* Thou.
,, comorensis Rchb. f.=*Jumellea comorensis.*
,, Curnowianus Rchb. f.=*Jumellea Curnowiana.*
,, Deistelianus Kränzl. =*Tridactyle tridactylites.*
,, distichus Rchb. f.=*Angraecum imbricatum.*
,, Englerianus Kränzl.=*Angraecum Englerianum.*
,, erythropollinius Rchb. f.=*Rhipidoglossum xanthopollinium.*
,, expansus S. Moore=*Angraecum expansum* Thou.
,, filicornis Rchb. f.=*Mystacidium capense.*
,, fragrans Rchb. f.=*Jumellea fragrans.*
,, Gerrardi Rchb. f.=*Rhipidoglossum Gerrardi.*
,, gladiifolius Rchb. f.=*Angraecum mauritianum* Frapp.
,, gladiator Rchb. f.=*Jumellea gladiator.*
,, gracilis Rchb. f.=*Mystacidium gracile* Harv.
,, Gravenreuthii Kränzl.=*Aerangis Gravenreuthii.*
,, Guyonianus Rchb. f.=*Gussonea globulosa* Ridl.
,, Leonii Rchb. f.=*Angraecum Leonii* Veitch.
,, macrostachyus Rchb. f.=*Beclardia macrostachys* A. Rich.
,, muscicola Rchb. f.=*Aerangis muscicola.*
,, pectinatus Rchb. f.=*Angraecum pectinatum* Thou.
,, pusillus Rchb. f.=*Mystacidium pusillum* Harv.
,, rutilus Rchb. f.=*Rhipidoglossum rutilum.*
,, sesquipedalis Rchb.f.=*Angraecum sesquipedale* Thou.
,, Thouarsii S. Moore=*Angraecum filicornu* Thou.
,, trifurcus Rchb. f.=*Angraecopsis trifurca.*
,, volucris Rchb. f.=*Oeonia volucris* Thou.
,, xanthopollinius Rchb. f.=*Rhipidoglossum xanthopollinium.*
Aerides macrostachyon Sprgl.=*Beclardia macrostachys* A. Rich.
Aerobion citratum Sprgl.=*Aerangis citrata.*
,, crassum Sprgl.=*Angraecum crassum* Thou.
,, cucullatum Sprgl.=*Angraecum cucullatum* Thou.
,, expansum Sprgl.=*Angraecum expansum.*
,, filicornu Sprgl.=*Angraecum filicornu* Thou.
,, fragrans Sprgl.=*Jumellea fragrans.*
,, gladiifolium Sprgl.=*Angraecum mauritianum* Frapp.

Aerobion implicatum Sprgl. = *Angraecum implicatum* Thou.
,, inapertum Sprgl. = *Angraecum inapertum* Thou.
,, multiflorum Sprgl. = *Angraecum multiflorum* Thou.
,, palmiforme Sprgl. = *Angraecum palmiforme* Thou.
,, rectum Sprgl. = *Jumellea recta.*
,, recurvum Sprgl. = *Jumellea recurva.*
,, striatum Sprgl. = *Angraecum striatum* Thou.
,, superbum Sprgl. = *Angraecum superbum* Thou.
Angorchis biloba O. Ktze. = *Aerangis biloba.*
,, Brongniartiana O. Ktze. = *Angraecum Brongniartianum* Rchb. f.
,, citrata O. Ktze. = *Aerangis citrata.*
,, clavigera O. Ktze. = *Angraecum clavigerum* Ridl.
,, conchifera O. Ktze. = *Angraecum conchiferum* Ldl.
,, crassa O. Ktze. = *Angraecum crassum* Thou.
,, cryptodon O. Ktze. = *Aerangis cryptodon.*
,, cucullata O. Ktze. = *Angraecum cucullatum* Thou.
,, eburnea O. Ktze. = *Angraecum eburneum* Bory.
,, Ellisii O. Ktze. = *Aerangis Ellisii.*
,, fastuosa O. Ktze. = *Aerangis fastuosa.*
,, Fragrangis O. Ktze. = *Angraecum cucullatum* Thou.
,, gladiifolia O. Ktze. = *Angraecum mauritianum* Frapp.
,, hyaloides O. Ktze. = *Aerangis hologlottis.*
,, implicata O. Ktze. = *Angraecum implicatum* Thou.
,, infundibularis O. Ktze. = *Angraecum infundibulare* Ldl.
,, modesta O. Ktze. = *Aerangis modesta.*
,, palmata O. Ktze. = *Angraecum palmiforme* Thou.
,, parvula O. Ktze. = *Angraecum parvulum* Ayes.
,, pusilla O. Ktze. = *Angraecum pusillum* Ldl.
,, ramosa O. Ktze. = *Angraecum ramosum* Thou.
,, recurva O. Ktze. = *Jumellea recurva.*
,, rostrata O. Ktze. = *Angraecum rostratum* Ridl.
,, saccifera O. Ktze. = *Angraecum sacciferum* Ldl.
,, Scottiana O. Ktze. = *Angraecum Scottianum* Rchb. f.
,, sesquipedalis O. Ktze. = *Angraecum sesquipedale* Thou.
,, spathulata O. Ktze. = *Jumellea Rutenbergiana.*
,, striata O. Ktze. = *Angraecum striatum* Thou.
,, superba O. Ktze. = *Angraecum superbum* Thou.
,, vesicata O. Ktze. = *Chamaeangis vesicata.*
Angraecum acutoemarginatum De Wild. = *Tridactyle acutoemarginata.*
,, acutum Ridl. = *Diaphananthe acuta.*
,, albidorubrum De Wild. = *Aerangis albidorubra.*
,, Althoffii Kränzl. = *Diaphananthe pellucida.*
,, Andersonii Rolfe = *Gussonea micropetala.*
,, angustifolium De Wild. = *Cyrtorchis angustifolia.*
,, antennatum Kränzl. = *Cyrtorchis Monteiroae.*
,, aphyllum Thou. = *Gussonea aphylla* A. Rich.
,, apiculatum Hook. = *Aerangis biloba.*
,, appendiculatum Boiv. = *Bonniera appendiculata* Cordem.
,, arachnopus Rchb. f. = *Aerangis arachnopus.*
,, arcuatum Ldl. = *Cyrtorchis arcuata.*
,, armeniacum Ldl. = *Tridactyle armeniaca.*
,, Arnoldianum De Wild. = *Angraecum Eichlerianum* Kränzl.
,, articulatum Schltr. = *Aerangis articulata.*
,, Aschersoni Kränzl. = *Cyrtorchis Aschersoni.*
,, ashantense Ldl. = *Diaphananthe ashantense.*
,, avicularium Rchb. f. = *Aerangis avicularia.*
,, Batesii Rolfe = *Aerangis Batesii.*
,, Batesii Schltr. = *Aerangis mixta.*
,, bicaudatum Ldl. = *Tridactyle bicaudata.*
,, Bieleri De Wild. = *Gussonea Bieleri.*

Angraecum biloboides De Wild. = *Aerangis biloboides.*
,, bilobum Ldl. = *Aerangis biloba.*
,, bistortum Rolfe = *Cyrtorchis bistorta.*
,, bokoyense De Wild. = *Calyptrochilum bokoyense.*
,, Bolusii Rolfe = *Tridactyle Bolusii.*
,, brachycarpum Rchb. f. = *Aerangis brachycarpa* Dur. et Schinz.
,, brunneo-maculatum Rendle = *Ancistrorhynchus brunneo-maculatus.*
,, Buchholzianum Kränzl. = *Cyrtorchis Buchholziana.*
,, Bueae Schltr. = *Diaphananthe Bueae.*
,, caespitosum Rolfe = *Gussonea caespitosa.*
,, caffrum Bol. = *Mystacidium caffrum* Bol.
,, calanthum Schltr. = *Aerangis calantha.*
,, capense Ldl. = *Mystacidium capense.*
,, capitatum Ldl. = *Cephalangraecum capitatum.*
,, caudatum Ldl. = *Leptocentrum caudatum.*
,, cephalotes Kränzl. = *Cephalangraecum Metteniae.*
,, Chailluanum Hook. f. = *Cyrtorchis Chailluana.*
,, Chilochistae Rchb. f. = *Gussonea Chilochistae.*
,, citratum Thou. = *Aerangis citrata.*
,, clandestinum Ldl. = *Ancistrorhynchus clandestinum.*
,, clandestinum Ldl. var. stenophyllum Schltr. = *Ancistrorhynchus stenophyllum.*
,, clavatum Rolfe = *Solenangis clavata.*
,, comorense Finet = *Jumellea comorense.*
,, confusum Schltr. = *Jumellea confusa.*
,, conicum Schltr. = *Gussonea conica.*
,, cordatiglandulum De Wild. = *Aerangis cordatiglandula.*
,, cornutum Rchb. f. = *Gussonea cornuta* Ridl.
,, crinale De Wild. = *Gussonea crinalis.*
,, cryptodon Rchb. f. = *Aerangis cryptodon.*
,, cyclochilum Schltr. = *Gussonea cyclochila.*
,, dactyloceras Schltr. = *Podangis dactyloceras.*
,, deflexicalcaratum De Wild. = *Gussonea deflexicalcarata.*
,, defoliatum Schltr. = *Gussonea defoliata.*
,, descendens Rchb. f. = *Aerangis articulata.*
,, distichum Ldl. = *Angraecum imbricatum.*
,, divitiflorum Schltr. = *Chamaeangis divitiflora.*
,, dolichorrhizum Schltr. = *Gussonea dolichorrhiza.*
,, ealense De Wild. = *Cyrtorchis ealensis.*
,, elatum Thou. = *Cryptopus elatus* Ldl.
,, elegans Rolfe = *Aerangis Henriquesiana.*
,, Ellisii Rchb. f. = *Aerangis Ellisii.*
,, Englerianum Kränzl. = *Aerangis Engleriana.*
,, erecto-calcaratum De Wild. = *Tridactyle erecto-calcarata.*
,, exile Cordem. = *Jumellea exilis.*
,, fastuosum Rchb. f. = *Aerangis fastuosa.*
,, filicornuides De Wild. = *Jumellea filicornuides.*
,, filifolium Schltr. = *Tridactyle filifolia.*
,, filipes Schltr. = *Aerangis filipes.*
,, fimbriatum Rendle = *Tridactyle fimbriata.*
,, fimbripetalum De Wild. = *Tridactyle fimbripetala.*
,, flabellifolium Rolfe = *Aerangis flabellifolia* Rchb. f.
,, Flanagani Bol. = *Mystacidium Flanagani* Bol.
,, flexuosum Rolfe = *Aerangis flexuosa.*
,, fragrans Thou. = *Jumellea fragrans.*
,, Frommianum Kränzl. = *Tridactyle Frommiana.*
,, fuscatum Rchb. f. = *Aerangis fuscata.*
,, Galeandrae Rchb. f. = *Eurychone Galeandrae.*
,, Gentilii De Wild. = *Tridactyle Gentilii.*

Angraecum Germinyanum Hook. = *Angraecum ramosum* Thou.
,, Gerrardi Bol. = *Rhipidoglossum Gerrardi.*
,, Gilpinae S. Moore = *Gussonea Gilpinae* Ridl.
,, gladiifolium Thou. = *Angraecum mauritianum* Frapp.
,, globulosum Hochst. = *Gussonea globulosa* Ridl.
,, glomeratum Ridl. = *Cephalangraecum glomeratum.*
,, Goetzeanum Kränzl. = *Tridactyle Goetzeana.*
,, gracile Thou. = *Chamaeangis gracilis.*
,, gracillimum Kränzl. = *Barombia gracillima.*
,, Grantii Batem. = *Aerangis Grantii.*
,, Guyonianum Rchb. f. = *Gussonea globulosa* Ridl.
,, Henriquesianum Rdl. = *Cyrtorchis Henriquesiana.*
,, Henriquesianum Rolfe = *Aerangis Henriquesiana.*
,, hologlottis Schltr. = *Aerangis hologlottis.*
,, Humblotii Rchb. f. = *Angraecum Leonii* Veitch
,, hyaloides Rchb. f. = *Aerangis hyaloides.*
,, ichneumoneum Ldl. = *Chamaeangis ichneumonea.*
,, imbricatum Ldl. = *Calyptrochilum emarginatum.*
,, inaequilongum De Wild. = *Tridactyle inaequilonga.*
,, injoloense De Wild. = *Cyrtorchis injoloensis.*
,, ischnopus Schltr. = *Angraecopsis ischnopus.*
,, Jumelleanum Schltr. = *Jumellea Henryi.*
,, kamerunense Schltr. = *Diaphananthe kamerunensis.*
,, Kindtianum De Wild. = *Tridactyle Kindtiana.*
,, Kirkii Rolfe = *Aerangis Kirkii.*
,, Koehleri Schltr. = *Gussonea Koehleri.*
,, konduense De Wild. = *Gussonea konduensis.*
,, Kotschyi Rchb. f. = *Aerangis Kotschyana.*
,, lagosense Rolfe = *Tridactyle lagosensis.*
,, latibracteatum De Wild. = *Cyrtorchis latibracteata.*
,, Laurentii De Wild. = *Aerangis Laurentii.*
,, Ledermannianum Kränzl. = *Diaphananthe vandiformis.*
,, lepidotum Rchb. f. = *Tridactyle lepidota.*
,, lignosum Schltr. = *Jumellea lignosa.*
,, liliodorum Frapp. = *Jumellea liliodora.*
,, Lujai De Wild. = *Eurychone Galeandrae.*
,, luteo-album Kränzl. = *Aerangis luteo-alba.*
,, macrocentrum Schltr. = *Aerangis macrocentra.*
,, macrorhynchium Schltr. = *Gussonea macrorhynchia.*
,, majale Schltr. = *Jumellea majalis.*
,, malangeanum Kränzl. = *Calyptrochilum malangeanum.*
,, marsupio-calcaratum Kränzl. = *Calyptrochilum marsupio-calcaratum.*
,, Maudae Bol. = *Bolusiella Maudae.*
,, megalorhizum Rchb. f. = *Gussonea megalorhiza.*
,, micropetalum Schltr. = *Gussonea micropetala.*
,, moandense De Wild. = *Aerangis moandensis.*
,, modestum Hook. = *Aerangis modesta.*
,, Moloneyi Rolfe = *Calyptrochilum Moloneyi.*
,, mombasense Rolfe = *Calyptrochilum mombasense.*
,, monodon Ldl. = *Diaphananthe monodon.*
,, Muansae Kränzl. = *Diaphananthe Muansae.*
,, multinominatum Rendle = *Angraecum clavatum.*
,, muriculatum Rendle = *Tridactyle muriculata.*
,, Mystacidii Rchb. f. = *Aerangis Mustacidii.*
,, nalaense De Wild. = *Tridactyle nalaensis.*
,, neglectum Frapp. = *Jumellea neglecta.*
,, nutans Frapp. = *Jumellea nutans.*
,, obversifolium Cordem. = *Angraecum obversifolium* Frapp.
,, occidentale Rolfe = *Angraecopsis occidentalis.*

Angraecum odoratissimum Rchb. f. = *Chamaeangis odoratissima.*
" oeoniodes Schltr. = *Solenangis clavata.*
" oliganthum Schltr. = *Chamaeangis oligantha.*
" ovalifolium De Wild. = *Calyptrochilum ovalifolium.*
" pachyurum Rolfe = *Aerangis pachyura.*
" palmatum Thou. = *Angraecum palmiforme* Thou.
" parviflorum Thou. = *Angraecopsis parviflora.*
" pellucidum Ldl. = *Diaphananthe pellucida.*
" penicillatum Cordem. = *Jumellea penicillata.*
" Perrierii Schltr. = *Gussonea Perrierii.*
" pertusum Ldl. = *Listrostachys pertusa* Rchb. f.
" Pescatorianum Ldl. = *Listrostachys Pescatoriana* S. Moore
" physophorum Rchb. f. = *Gussonea physophora* Ridl.
" Plehnianum Schltr. = *Diaphananthe Plehniana.*
" polystachyum A. Rich. = *Oeoniella polystachys.*
" potamophilum Schltr. = *Aerangis potamophila.*
" pulchellum Schltr. = *Aerangis pulchella.*
" Pynaertii De Wild. = *Calyptrochilum Pynaertii.*
" Quintasii Rolfe = *Diaphananthe Quintasii.*
" rectum Thou. = *Jumellea recta.*
" recurvum Thou. = *Jumellea recurva.*
" Reichenbachianum Kränzl. = *Angraecum Scottianum* Rchb. f.
" rhipsalisocium Rchb. f. = *Aerangis rhipsalisocia.*
" rhodesianum Rendle = *Tridactyle rhodesiana.*
" rhodostictum Schltr. = *Aerangis rhodosticta.*
" Rohlfsiana Kränzl. = *Aerangis Rohlfsiana.*
" roseocalcaratum De Wild. = *Aerangis roseocalcarata.*
" Rothschildianum O'Brien = *Eurychone Rothschildiana.*
" Rutenbergianum Kränzl. = *Jumellea Rutenbergiana.*
" Sanderianum Rchb. f. = *Aerangis modesta.*
" sankuruense De Wild. = *Aerangis sankuruensis.*
" Saundersiae Bol. = *Aerangis mystacidii.*
" scabripes Kränzl. = *Angraecum verrucosum* Rendle
" scandens Schltr. = *Solenangis scandens.*
" Schoellerianum Kränzl. = *Calyptrochilum Schoellerianum.*
" Schumanni Kränzl. = *Phormangis Schumanni.*
" Scottellii Rendle = *Tridactyle Scottellii.*
" Sedeni Nichols. = *Cyrtorchis Sedeni.*
" semipedale Rendle = *Aerangis Kotschyana.*
" Sereti De Wild. = *Cyrtorchis Sereti.*
" Smithii Rolfe = *Gussonea Smithii.*
" Solheidi De Wild. = *Aerangis Solheidi.*
" somalense Schltr. = *Aerangis somalensis.*
" spathulatum Ridl. = *Jumellea Rutenbergiana.*
" stella Schltr. = *Aerangis Gravenreuthii.*
" stenophyllum Frapp. = *Jumellea stenophylla.*
" stipitatum Frapp. = *Jumellea stipitata.*
" stipulatum De Wild. = *Tridactyle stipulata.*
" Straussii Schltr. = *Ancistrorhynchus Straussii.*
" stylosum Rolfe = *Aerangis stylosa.*
" subclavatum Rolfe = *Diaphananthe subclavata.*
" subcylindrifolium De Wild. = *Cyrtorchis subcylindrifolia.*
" subfalcifolium De Wild. = *Diaphananthe subfalcifolia.*
" tenerrimum Schltr. = *Angraecum tenerrima* Kränzl.
" thomense Rolfe = *Chamaeangis thomensis.*
" Thomsoni Rolfe = *Aerangis Thomsoni.*
" trachyrhizum Schltr. = *Tridactyle trachyrhiza.*
" tricuspe Bol. = *Tridactyle tricuspis.*
" tridactylites Rolfe = *Tridactyle tridactylites.*
" tridens Ldl. = *Angraecopsis trifurca.*

Angraecum tridentatum Harv.=*Tridactyle tridentata.*
,, triquetrum Thou.=*Jumellea triquetra.*
,, vagans Ldl.=*Chamaeangis vagans.*
,, Verdickii De Wild.=*Aerangis Verdickii.*
,, verruculosum Boiv.=*Angraecum implicatum* Thou.
,, vesicatum Ldl.=*Chamaeangis vesicata.*
,, virens Ldl.=*Angraecum eburneum.*
,, virgula Kränzl.=*Tridactyle virgula.*
,, viride Kränzl.=*Angraecum Braunii.*
,, viridescens De Wild. =*Tridactyle Laurentii.*
,, Voeltzkowianum Kränzl.=*Angraecum comorense* Kränzl.
,, Whitfieldii Rendle=*Tridactyle Whitfieldii.*
,, Woodianum Schltr.=*Rhipidoglossum Woodianum.*
,, Zenkeri Schltr.=*Bolusiella Zenkeri.*
,, zigzag De Wild.=*Calyptrochilum zigzag.*
Beclardia elata A. Rich.=*Cryptopus elatum* Ldl.
Calyptrochilum Preussii Kränzl.=*Calyptrochilum emarginatum.*
Dendrobium arachnites Thou.=*Aeranthes arachnites* Ldl.
Dicranotaenia dahomensis Finet=*Gussonea dahomensis.*
Epidendrum brachystachya Thou.=*Beclardia brachystachya* A. Rich.
,, capense Linn.=*Mystacidium capense.*
,, imbricatum Sw.=*Angraecum imbricatum.*
,, macrostachys Thou.=*Beclardia macrostachys* A. Rich.
,, polystachys Thou.=*Oeoniella polystachys.*
,, volucre Thou.=*Oeonia volucris* Thou.
Epidorchis calceolus O. Ktze.=*Angraecum calceolus* Thou.
,, carpophora O. Ktze.=*Angraecum carpophora* Thou.
,, expansa O. Ktze.=*Angraecum expansum* Thou.
,, graminifolia O. Ktze.=*Angraecum graminifolium.*
,, inaperta O. Ktze.=*Angraecum inapertum* Thou.
,, multiflora O. Ktze.=*Angraecum multiflorum* Thou.
,, recta O. Ktze.=*Jumellea recta.*
,, saccifera O. Ktze.=*Angraecum sacciferum* Ldl.
,, subulata O. Ktze.=*Angraecum subulatum* Ldl.
,, tenellum O. Ktze.=*Angraecum tenellum.*
,, volucris O. Ktze.=*Oeonia volucris* Thou.
Eulophia angustifolia Eckl. et Zeyh.=*Tridactyle bicaudata.*
,, longicornis Sprgl.=*Mystacidium capense.*
Gastochilus striatus O. Ktze.=*Angraecum striatum* Thou.
Lepervanchea tenuifolia Cordem.=*Angraecum tenuifolium* Frapp.
Limodorum bidens Afz.=*Diaphananthe bidens.*
,, eburneum Willd.=*Angraecum eburneum* Bory
,, emarginatum Sw.=*Calyptrochilum emarginatum.*
,, longicorne Thbg.=*Mystacidium capense.*
,, longicornu Sw.=*Mystacidium capense.*
Listrostachys acuminata Rolfe=*Cyrtorchis acuminata.*
,, acuta Rolfe=*Diaphananthe acuta.*
,, Althoffii Dur. et Schinz=*Diaphananthe pellucida.*
,, amaniensis Kränzl.=*Leptocentrum amaniense.*
,, Aphrodite Balf.=*Oeoniella Aphrodite.*
,, arcuata Rchb. f.=*Cyrtorchis arcuata.*
,, Aschersoni Dur. et Schinz=*Cyrtorchis Aschersoni.*
,, ashantensis Rchb. f.=*Diaphananthe ashantense.*
,, Batesii Rolfe=*Bolusiella Batesii.*
,, Behnickiana Kränzl.=*Listrostachys pertusa* Rchb. f.
,, bidens Rolfe=*Diaphananthe bidens.*
,, bicaudatum Finet=*Tridactyle bicaudata.*
,, biloba Kränzl.=*Aerangis biloba.*
,, bistorta Rolfe=*Cyrtorchis bistorta.*
,, bracteosa Rolfe=*Angraecum bracteosum* Balf. f. et S. Moore

Listrostachys Braunii Dur. et Schinz = *Cephalangraecum Metteniae*.
" Brownii Rolfe = *Cyrtorchis Brownii*.
" Buchholziana Dur. et Schinz = *Cyrtorchis Buchholziana*.
" capitata Rchb. f. = *Cephalangraecum capitatum*.
" caudata Rchb. f. = *Leptocentrum caudatum*.
" cephalotes Rchb. f. = *Cephalangraecum cephalotes*.
" Chailluana Rchb. f. = *Cyrtorchis Chailluana*.
" clandestina Rchb. f. = *Ancistrorhynchus clandestinus*.
" clavata Rendle = *Angraecum clavatum*.
" dactyloceras Rchb. f. = *Podangis dactyloceras*.
" Dewevrei De Wild. = *Chamaeangis Dewevrei*.
" divitiflora Kränzl. = *Diaphananthe divitiflora*.
" Droogmansiana De Wild. = *Cyrtorchis Droogmansiana*.
" Durandiana Kränzl. = *Ancistrorhynchus Durandianus*.
" ealensis De Wild. = *Cyrtorchis ealensis*.
" Elliottii Finet = *Gussonea Elliottii*.
" Engleriana Kränzl. = *Aerangis Engleriana*.
" Erythraeae Rolfe = *Cyrtorchis Erythraeae*.
" falcata De Wild. = *Diaphananthe falcata*.
" filiformis Kränzl. = *Tridactyle filiformis*.
" fimbriata Rolfe = *Diaphananthe fimbriata*.
" forcipata Kränzl. = *Podangis dactyloceras*.
" fragrantissima Rchb. f. = *Diaphananthe fragrantissima*.
" gabonensis Rolfe = *Rhipidoglossum rutilum*.
" Gentilii De Wild. = *Cephalangraecum Gentilii*.
" glomerata Rolfe = *Cephalangraecum glomeratum*.
" graminifolia Kränzl. = *Aerangis graminifolia*.
" hamata Rolfe = *Cyrtorchis hamata*.
" Henriquesiana Rolfe = *Cyrtorchis Henriquesiana*.
" Hookeri Rolfe = *Cyrtorchis Hookeri*.
" ichneumonea Rchb. f. = *Chamaeangis ichneumonea*.
" ignoti Kränzl. = *Cyrtorchis Hookeri*.
" imbricata Rolfe = *Bolusiella imbricata*.
" injoloensis De Wild. = *Cyrtorchis injoloensis*.
" iridifolia Rolfe = *Bolusiella iridifolia*.
" Kirkii Rolfe = *Diaphananthe Kirkii*.
" latibracteata De Wild. = *Cyrtorchis latibracteata*.
" Lecomtei Finet = *Chamaeangis Lecomtei*.
" linearifolia De Wild. = *Tridactyle linearifolia*.
" longissima Kränzl. = *Diaphananthe mystacidioides*.
" Margaritae De Wild. = *Diaphananthe Margaritae*.
" Metteniae Kränzl. = *Cephalangraecum Metteniae*.
" Monteirae Rchb. f. = *Cyrtorchis Monteiroae*.
" multiflora Rolfe = *Rhipidoglossum rutilum*.
" muscicola Rolfe = *Aerangis muscicola*.
" mystacidioides Kränzl. = *Diaphananthe mystacidioides*.
" odoratissima Rchb. f. = *Chamaeangis odoratissima*.
" palmiformis Dur. et Schinz = *Angraecum palmiforme* Thou.
" Papagayi Rchb. f. = *Diaphananthe Papagayi*.
" parviflora S. Moore = *Angraecopsis parviflora*.
" pellucida Rchb. f. = *Diaphananthe pellucida*.
" polydactyla Kränzl. = *Crossangis polydactyla*.
" polystachys Rchb. f. = *Oeoniella polystachys*.
" pulchella Kränzl. = *Mystacidium pulchellum*.
" Pynaertii De Wild. = *Chamaeangis odoratissima*.
" refracta Kränzl. = *Cyrtorchis refracta*.
" rhipsalisocia Rolfe = *Aerangis rhipsalisocia*.
" rutila Ridl. = *Rhipidoglossum rutilum*.
" saxicola Kränzl. = *Podangis dactyloceras*.
" Scheffleriana Kränzl. = *Rhipidoglossum Woodianum*.

Listrostachys Sedeni Rchb. f. = *Cyrtorchis Sedeni.*
„ Sereti De Wild. = *Cyrtorchis Sereti.*
„ subclavata Rolfe = *Diaphananthe subclavata.*
„ subcylindrifolia De Wild. = *Cyrtorchis subcylindrifolia.*
„ subfalcifolia De Wild. = *Diaphananthe subfalcifolia.*
„ subulata Rchb. f. = *Angraecum subulatum* Ldl.
„ thomensis Rolfe = *Chamaeangis thomensis.*
„ Thonneriana Kränzl. = *Diaphananthe pellucida.*
„ trachypus Kränzl. = *Aerangis rhipsalisocia.*
„ tridens Rchb. f. = *Angraecum tridens.*
„ trifurca Finet = *Angraecopsis trifurca.*
„ urostachya Kränzl. = *Chamaeangis urostachya.*
„ vagans Rolfe = *Chamaeangis vagans.*
„ vandaeformis Kränzl. = *Diaphananthe vandiformis.*
„ vesicata Rchb. f. = *Chamaeangis vesicata.*
„ virgula Rolfe = *Tridactyle virgula.*
„ Welwitschii Rchb. f. = *Diaphananthe Welwitschii.*
„ Whytei Rolfe = *Cyrtorchis Whytei.*
„ Wittmacki Rolfe = *Cyrtorchis Wittmackii.*
„ Zenkeri Kränzl. = *Bolusiella Zenkeri.*
„ Zenkeriana Kränzl. = *Listrostachys pertusa* Rchb. f.
Macroplectrum Baronii Finet = *Angraecum Baronii.*
„ calceolus Finet = *Angraecum calceolus* Thou.
„ cucullatum Finet = *Angraecum cucullatum* Thou.
„ Didieri Finet = *Angraecum Didieri* Baill.
„ distichophyllum Finet = *Angraecum distichophyllum* A. Rich.
„ distichum Finet = *Angraecum imbricatum.*
„ gladiifolium Pfitz. = *Angraecum mauritianum* Frapp.
„ implicatum Finet = *Angraecum implicatum* Thou.
„ Leonis Finet = *Angraecum Leonii* Veitch
„ madagascariense Finet = *Angraecum madagascariense.*
„ pectinatum Finet = *Angraecum pectinatum* Thou.
„ ramosum Finet = *Angraecum ramosum* Thou.
„ rectum Finet p.p. = *Jumellea recta.*
„ rectum Finet p.p. = *Jumellea recurva.*
„ sesquipedale Pfitz. = *Angraecum sesquipedale* Thou.
„ xylopus Finet = *Angraecum xylopus* Rchb. f.
Microcoelia exilis Ldl. = *Gussonea exilis* Ridl.
„ ?taeniophyllum Hochst. = *Gussonea globulosa* Ridl.
Monixus claviger Finet = *Angraecum clavigerum.*
„ graminifolius Finet = *Angraecum graminifolium.*
„ multiflorus Finet = *Angraecum multiflorum* Thou.
„ polystachys Finet = *Oeoniella polystachys.*
„ striatus Finet = *Angraecum striatum* Thou.
Mystacidium aphyllum Dur. et Schinz = *Gussonea aphylla* A. Rich.
„ appendiculatum De Wild. = *Aerangis appendiculata.*
„ astroarche Rolfe = *Angraecum astroarche* Ridl.
„ Batesii Rolfe = *Aerangis mixta.*
„ calceolus Cordem. = *Angraecum calceolus* Thou.
„ carpophorum Cordem. = *Angraecum carpophorum* Thou.
„ cilaosianum Cordem. = *Angraecum cilaosianum.*
„ clavatum Rolfe = *Angraecum clavatum.*
„ comorense Dur. et Schinz = *Jumellea comorensis.*
„ conjolense De Wild. = *Rhipidoglossum rutilum.*
„ costatum Cordem. = *Angraecum costatum* Frapp.
„ dauphinense Rolfe = *Angraecum dauphinense.*
„ distichum Pfitz. = *Angraecum imbricatum.*
„ dolabriforme Rolfe = *Angraecopsis dolabriformis.*
„ erythropollinium Dur. et Schinz = *Rhipidoglossum xanthopollinium.*

Mystacidium filicorne Ldl.=*Mystacidium capense.*
,, Germinyanum Rolfe=*Angraecum ramosum* Thou.
,, Gerrardi Bol.=*Rhipidoglossum Gerrardi.*
,, gladiifolium Rolfe=*Angraecum mauritianum.*
,, globulosum Dur. et Schinz=*Gussonea globulosa* Ridl.
,, graminifolium Ridl.=*Angraecum graminifolium.*
,, Gravenreuthii Rolfe=*Aerangis Gravenreuthii.*
,, Hariotianum Kränzl.=*Chamaeangis Hariotiana.*
,, Hermanni Cordem.=*Angraecum Hermanni.*
,, Humblotii Finet=*Angraecum Finetianum.*
,, inapertum Ridl.=*Angraecum inapertum* Ridl.
,, infundibulare Rolfe=*Angraecum infundibulare* Ldl.
,, Keniae Rolfe=*Angraecum Keniae* Kränzl.
,, Laurentii De Wild.=*Tridactyle Laurentii.*
,, Ledermannianum Kränzl.=*Tridactyle Ledermanniana.*
,, Leonis Rolfe=*Angraecum Leonii* Veitch
,, longicornu Dur. et Schinz=*Mystacidium capense.*
,, longinode Cordem.=*Angraecum longinode* Frapp.
,, Mahoni Rolfe=*Rhipidoglossum Woodianum.*
,, mauritianum Dur. et Schinz=*Angraecum mauritianum* Frapp.
,, Mildbraedii Kränzl.=*Diaphananthe Mildbraedii.*
,, minutum Cordem.=*Angraecum minutum* Frapp.
,, multiflorum Cordem.=*Angraecum multiflorum* Thou.
,, muscicolum Dur. et Schinz=*Aerangis muscicola.*
,, nanum Cordem.=*Angraecum nanum* Frapp.
,, ochraceum Ridl.=*Angraecum ochraceum.*
,, pectinatum Benth.=*Angraecum pectinatum* Thou.
,, Peglerae Bol.=*Rhipidoglossum Peglerae.*
,, pingue Cordem.=*Angraecum pingue* Frapp.
,, polyanthum Kränzl.=*Sarcorhynchus polyanthus.*
,, productum Kränzl.=*Diaphananthe producta.*
,, pseudo-petiolatum Cordem.=*Angraecum pseudo-petiolatum* Frapp.
,, radicosum Dur. et Schinz=*Gussonea globulosa* Ridl.
,, rutilum Dur. et Schinz=*Rhipidoglossum rutilum.*
,, Schumanni Rolfe=*Phormangis Schumanni.*
,, sesquipedale Rolfe=*Angraecum sesquipedale* Thou.
,, spicatum Cordem.=*Angraecum spicatum.*
,, striatum Cordem.=*Angraecum Cordemoyi.*
,, tenellum Ridl.=*Angraecum tenellum.*
,, tridens Rolfe=*Angraecum tridens.*
,, trifurcum Dur. et Schinz=*Angraecum trifurca.*
,, undulatum Cordem.=*Angraecum undulatum.*
,, verrucosum Rolfe=*Angraecum verrucosum* Rendle.
,, viride Ridl.=*Angraecum viride.*
,, xanthopollinium Dur. et Schinz=*Rhipidoglossum xanthopollinium.*
,, zeylanicum Trimen=*Angraecum zeylanicum* Ldl.
Oeceoclades parviflora Ldl.=*Angraecopsis parviflora.*
Oeonia brachystachya Ldl.=*Beclardia brachystachya* A. Rich.
,, macrostachya Ldl.=*Beclardia macrostachya* A. Rich.
,, polystachya Bth.=*Oeoniella polystachys.*
,, robusta Schltr.=*Angraecum robustum.*
Orchis mauritiana Poiv.=*Angraecum mauritianum* Frapp.
,, Thouarsii Cordem.=*Angraecum pectinatum.*
Radinocion flexuosum Ridl.=*Aerangis flexuosa.*
Rhaphidorhynchus aphyllus Finet=*Gussonea aphylla* A. Rich.
,, Chilochistae Finet=*Gussonea Chilochistae.*
,, citratus Finet=*Aerangis citrata.*

Rhaphidorhynchus cornutus Finet=*Gussonea cornuta.*
,, Curnowianus Finet=*Jumellea Curnowiana.*
,, fastuosus Finet=*Aerangis fastuosa.*
,, Kotschyi Finet=*Aerangis Kotschyana.*
,, macrostachys Finet=*Beclardia macrostachya* A. Rich.
,, modestus Finet=*Aerangis modesta.*
,, Perrierii Finet=*Gussonea Perrierii.*
,, Pobeguinii Finet=*Chamaeangis Pobeguinii.*
,, spiculatus Finet=*Leptocentrum spiculatum.*
,, umbonatus Finet=*Aerangis umbonata.*

XLI.—CONTRIBUTIONS TO THE FLORA OF SIAM* ADDITAMENTUM XIX. W. G. Craib.

Impatiens betongensis *Craib* [Balsaminaceae]; ab affini *I. exilipede* Hook. f. ex Ridl. foliis oppositis rarius verticillatis, sepalis lateralibus dorso pilosis recedit.

Herba annua; caules erecti, circa 60 cm. alti, simplices vel saepe breviter ramosi, cito glabri, sicco straminei. *Folia* opposita vel rarius per tria, lanceolata vel oblongo-oblanceolata, apice acuminata vel saltem angustata, summo apice mucronata, basi attenuato-cuneata vel acuminata, 5·5–10 cm. longa, 1·7–3·7 cm. lata, membranacea, sicco viridia, subtus pallidiora, pagina superiore setulis paucis instructa, inferiore ad costam nervosque laterales sparse pilosa vel mox fere glabra, nervis lateralibus utrinque 5–7 pagina utraque, sed inferiore magis, conspicuis intra marginem sursum curvatis mox evanidis, margine anguste apiculato-serrulata vel crenulato-serrulata, petiolo 1–4 cm. longo primo parce piloso mox glabro superne lamina decurrente anguste alato suffulta; glandulae stipuliformes evolutae, circa 3 mm. longae, persistentes vel deciduae. *Pedicelli* axillares, solitarii, circa 4·5 cm. longi vel sub fructu ad 6 cm. longi, glabri, mox patuli; flores punicei (ex *Kerr*). *Sepala* 3; duo lateralia oblonga, longius apiculata, parum inaequilateralia, 7·5 mm. longa, 3 mm. lata, dorso ferrugineo-pilosa, ciliata; posticum (labellum), limbo 3·5 mm. longo apice 11 mm. diametro, calcare gracili 3·5 cm. longo. *Vexillum* transverse elliptico-rotundatum, apice emarginatum, apiculo recurvo instructum, 10 mm. longum, 14 mm. latum, dorso medio pubescens et basem versus alatum; alae inter se liberae, 1·7 cm. longae, lobo basali subelliptico 10 mm. longo, 8 mm. lato, distali apice parum retuso apiculato 11 mm. lato. *Filamenta* 2 mm. longa. *Ovarium* glabrum, 3 mm. altum.

Pattani, Betong, 200 m., by stream in evergreen forest, *Kerr* 7685.

Glycosmis parva *Craib* [Rutaceae-Auranticae]; a *G. montana* Pierre foliis angustioribus, filamentis inferne ampliatis, a

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* Continued from *K.B.*, 1926, p. 174.

G. dinhense Pierre ex Guillaumin petalis haud dorso pilosis, foliis haud longe acuminatis recedit.

Frutex circa 1·5 m. altus (ex *Kerr*); ramuli graciles, primo subferrugineo-tomentosi vel pubescentes, compressi, mox puberuli, cortice cinereo vel brunneo-cinereo obtecti, lenticellis haud conspicuis. *Folia* alterna, interdum subopposita, lanceolata, apice obtusa, interdum retusa, rarius subacuminata, 3·5–9 cm. longa, 1–2·5 cm. lata, chartaceo-coriacea, supra viridia, ad costam breviter subtomentella vel matura fere glabra, subtus pallide viridia, subglabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11–14 rectis intra marginem anastomosantibus supra obscuris vel subconspicuis subtus subprominentibus, aliis paulo minus validis interpositis, nervulis subtus prominulis, margine integra, petiolo 2–6 mm. longo primo puberulo mox fere glabro supra canaliculato suffulta. *Inflorescentia* axillaris, petiolo subaequilonga vel eo paululo longior, pedunculo communi ferrugineo-pubescente perbrevi vel sub fructu circa 1 mm. longo suffulta; flores albi (ex *Kerr*), pedicello brevi articulato subglabro bracteolato suffulti. *Sepala* 5, subrotundata, vix 1·5 mm. diametro, dorso glabra, glandula unica prominente instructa, ciliata. *Petala* 5, oblongo-lanceolata, apice obtusa, basi angustata, 4 mm. longa, 1·5 mm. lata, glabra, glandulosa. *Discus* brevis, crenulatus, glaber. *Filamenta* complanata, apice acuminata, ad 2·5 mm. longa, glabra, antheris 0·75 mm. longis apice glandula parva conspicua globosa ornatis. *Pistillum* glabrum, 1·75 mm. altum, glandulosum, stylo valido vix distincto. *Fructus* subellipsoideus, circa 7 mm. longus.

Krabin, Sakêo, 50 m., evergreen forest, *Kerr* 9766.

Glycosmis subsessilis *Craib* [Rutaceae-Aurantieae]; a *G. montana* Pierre inflorescentia fere sessili, petalis et ovario haud glabris recedit.

Fruiex 2–3-metralis (ex *Kerr*); ramuli primo dense griseo- vel ferrugineo-tomentelli, plus minusve compressi, mox puberuli, demum glabri, cortice cinereo vel brunneo-cinereo obtecti, lenticellis haud conspicuis. *Folia* unifoliolata vel rarius 3-foliolata, petiolo ad 2·5 cm. longo subterete puberulo suffulta; foliola ovata, ovato-lanceolata, vel rarius oblongo-elliptica, apice acuminata vel subacuminata, basi rotundata vel cuneato-rotundata, saepe acuminata, 4·5–9·5 cm. longa, 2·3–4·5 cm. lata, lateralia, ubi evoluta, alterna, circa 4·5 cm. longa, coriacea, supra viridia, saepe nitida, subtus pallide viridia vel saepe sublutescentia, pagina utraque ad costam puberula, aliter glabra vel sparse breviter puberula, nervis lateralibus utrinque 8–9 supra obscuris vel parum prominulis subtus subprominentibus rectis vel subrectis intra marginem anastomosantibus, nervulis supra paucis saepe subprominulis subtus rete laxum prominulum efficientibus, margine obsolete crenulata, petiolulo incrassato 3–5 mm. longo puberulo supra canaliculato suffulta. *Inflorescentia* axillaris, congesta,

circa 5 mm. longa, pedunculo communi perbrevi ferrugineo-piloso suffulta; pedicelli etiam perbreves, articulati, bracteolati. *Sepala* 5, circa 1 mm. longa, apice rotundata, dorso nisi marginem versus ferrugineo-pilosula, intra subglabra, glandula unica prominente instructa, ciliata. *Petala* 5, oblongo-oblanceolata, apice obtusa, 2·75 mm. longa, 1·25 mm. lata, dorso ferrugineo-pilosula, intra glabra, glandulosa. *Stamina* 10, filamentis complanatis apice acuminatis glabris 1·25 mm. longis, antheris 0·75 mm. longis apiculatis. *Ovarium* ovoideum, 1·5 mm. altum, dense ferrugineo-pilosulum, stigmate sessili pallido.

Kêng Koi, Mênam Pasak, 50 m., evergreen forest on limestone hill, *Kerr* 7964.

Glycosmis Winitii *Craib* [Rutaceae-Aurantieae]; ab affini *G. puberula* Lindl. inflorescentia maiore terminali differt.

Arbor 5–8-metralis (ex *Kerr*); ramuli iuventute dense breviter ferrugineo-tomentosi, cito glabrescentes, cortice pallido demum rubro-brunneo obtecti. *Folia* alterna, 5–9-foliolata, 16–27 cm. (petiolo 2–3·5 cm. longo incluso) longa, et petiolo et rhachi primo indumento ei ramulorum simili tectis mox glabris teretibus vel hoc ad foliorum insertionem paulo complanato; foliola alterna, terminali excepto inferne inaequilateralia, anguste oblonga, oblonga, vel oblongo-oblanceolata, apice acuminata vel caudato-acuminata, summo apice obtusa vel costa excurrente brevissime apiculata, basi terminalia cuneata, lateralia saepissime latere altero cuneata vel acuminata, altero cuneata, late cuneata, vel rotundato-cuneata, 5–14 cm. longa, 2–5 cm. lata, chartacea vel rigide chartacea, sicco viridia, subtus pallidiora, pagina utraque matura glabra, nervis lateralibus utrinque 9–12 intra marginem anastomosantibus supra gracilibus conspicuis vel subconspicuis subtus prominulis, nervulis supra interdum conspicuis subtus gracilibus subprominulis, margine integra, petiolulo 5–7 mm. longo supra canaliculato suffulta. *Panicula* floribunda, terminalis, ad 15 cm. longa et 13 cm. lata, sessilis vel pedunculo communi ad 4 cm. longo suffulta, indumento ei ramulorum simili ferrugineo tecta, cito plus minusve glabrescens; pedunculi partiales ad 1·7 cm. longi; pedicelli circa 3 mm. longi; alabastra subglobosa, dense ferrugineo-tomentella. *Sepala* deltoidea, obtusa, circa 0·75 mm. longa. *Petala* oblongo-oblanceolata, obtusa, basi in stipitem brevem attenuata, 5·5 mm. longa, 2 mm. lata, dorso persistenter ferrugineo-tomentella, intra sparse pubescentia sed glabrescentia. *Filamenta* 4·5 mm. longa, infra medium parum ampliata, glabra, antheris 1·5 mm. longis glabris. *Ovarium* 1·25 mm. longum, inferne glabrum, apice breviter ferrugineo-pubescens, stylo crasso paululo longius, glandulis 5 apice instructum, 5-loculare, ovulis in loculis solitariis.

Doi Thom, 750 m., evergreen forest, *Winit* 9 (*type*). Lampang, Mê Ta, 300 m., deciduous jungle on rocky limestone hill, *Kerr* 4841. Chiengdao, Mê Poi, 500 m., rocky limestone hill, *Kerr* 5238.

Murraya siamensis *Craib* [Rutaceae-Aurantieae]; a *M. Koenigii* Spreng. fructu maiore globoso haud ambitu oblongo inter alia recedit.

Arbor parva, caule cortice fusco alte rugato obtecto (ex *Winit*); ramuli iuventute crispatim pubescentes, annotini puberuli, demum fusco-corticati, parvi-lenticellati. *Folia* 15–24 cm. (petiolo 1–2·5 cm. longo incluso) longa, petiolo et rhachi subteretibus densius crispatim pubescentibus; foliola 17–25, alterna vel rarius subopposita, inaequilateralia, latere altero dimidiatim oblanceolata vel lanceolata, basi angustata, altero dimidiatim ovata, basi subtruncata, apice obtusa, subacuminata, 2–7 cm. longa, 1–2·7 cm. lata, chartacea, supra crispatim pubescentia, cito plus minusve glabrescentia, subtus praesertim ad costam pubescentia, nervis lateralibus utrinque 5–7 intra marginem anastomosantibus supra mox conspicuis subtus prominulis, nervulis supra subconspicuis subtus rete gracile prominulum efficientibus, margine subintegra vel plus minusve obsolete crenulata, petiolulo circa 2 mm. longo densius crispatim pubescente suffulta. *Panicula* terminalis, subcorymbosa, 1·5 cm. longa; pedicelli 3–4 mm. longi, breviter crispatim pubescentes. *Sepala* 5, ovato-lanceolata vel deltoidea, obtusa, 1·25 mm. longa, extra breviter crispatim pubescentia. *Petala* 5, lineari-oblanceolata, incurvo-apiculata, 6·5 mm. longa, 1·75 mm. lata, glabra, medio incrassata, imbricata. *Discus* carnosus, glaber, calyce paulo brevior. *Stamina* 10, alterna breviora et longiora, filamentis 4–5 mm. longis apicem versus angustatis parte dimidia inferiore paulo ampliatis sed vix complanatis, antheris circa 1 mm. longis papillosis. *Ovarium* ambitu suboblongum, vix 1·5 mm. longum, glabrum, breviter stipitatum; stylus 3·5 mm. longus, basi articulatus, glaber, stigmate capitato. *Fructus* vix maturus, 1 cm. diametro.

Lampang, Mê Kat, 250 m., deciduous jungle, *Winit* 849 (*type*). Mê Ping Rapids, Ok Ma, 135 m., mixed jungle on river bank, *Kerr* 2188.

Clausena longipes *Craib* [Rutaceae-Aurantieae]; a *C. suffruticosa* Wight et Arn. et *C. Willdenowii* Wight et Arn. partibus omnibus gracilioribus, pedicellis longioribus recedit.

Frutex 2–4-metralis (ex *Kerr*); ramuli graciles, iuventute crispatim pubescentes, sicco straminei, mox glabri, cortice cinereo-brunneo vel fusco-brunneo obtecti, lenticellis numerosis parvis hic et illic conspicuis. *Folia* pinnata, 15–20 cm. (petiolo 3–4 cm. longo incluso) longa, et petiolo et rhachi breviter crispatim pubescentibus et glandulis instructis; foliola 11, alterna, ovata vel late lanceolata, apice acuminata, summo apice obtusa vel breviter mucronulata, basi plus minusve inaequilateralia, rotundata vel late cuneata, usque ad 6·5 cm. longa et 2·5 cm. lata, membranacea, sicco viridia, supra ad costam nervosque laterales interdum etiam nervulos robustiores breviter crispatim pubescentia, subtus glabra vel subglabra, nervis lateralibus utrinque 6–8 supra subconspicuis

subtus prominulis, hic et illic ciliata, glandulis marginalibus conspicuis, petiolulo circa 1 mm. longo densius crispatim pubescente suffulta. *Inflorescentia* racemosa, rarissime paniculata, e parte inferiore nuda ramulorum hornotinorum orta, ramulo quoque saepissime 2 vel 3 gerente, ad 10 cm. (pedunculo communi 3–5 cm. longo incluso) longa, sparse crispatim pubescens, cito glabrescens; bracteae deciduae; pedicelli graciles, 5–12 mm. longi. *Sepala* 4, lanceolata vel rarius subovata, acuta, 1·25–2 mm. longa, usque ad 0·75 mm. lata, ciliata, glabra vel dorso pilis sparsis instructa. *Petala* oblongo-obovata, 4 mm. longa. *Filamenta* 3 mm. longa, inferne ampliata, superne gracilia, papillosa; antherae 1·25 mm. longae. *Ovarium* 1·5 mm. altum, glabrum, glandulosum, gynophoro 0·75 mm. longo glabro suffultum; stylus glaber, ovario subaequilongus, deciduus.

Mê Lan, Mê Hawng Sawn, 700 m., on limestone rocks, *Kerr* 5486A, 5486.

Ouratea arcta *Craib* [Ochnaceae-Ochneae]; ab affini *O. angustifolia* Baillon inflorescentia angusta recedit.

Frutex c. 2 m. altus (ex *Kerr*), partibus omnibus glaber; ramuli graciles, cortice brunneo-cinereo vel cinereo obtecti. *Folia* oblonga, oblongo-lanceolata vel oblongo-oblanceolata, apice acuminata, acuta, basi cuneata vel subacuminato-cuneata, 8–21 cm. longa, 2·3–5 cm. lata, chartacea, sicco subtus pallidiora, nervis lateralibus numerosis approximatis inter se parallelis patulis pagina utraque conspicuis vel superiore subconspicuis, nervis intramarginalibus solitariis conspicuis vel in foliis maioribus geminis, nervulis rete gracile pagina utraque conspicuum efficientibus, margine, parte triente vel dimidia inferiore excepta, serrulata, petiolo 2–5 mm. longo incrassato suffulta; stipulae circa 5 mm. longae, deciduae. *Paniculae* terminales, racemiformes, ad 8 cm. longae, pedunculis partialibus haud evolutis, fasciculis inter se sat distantibus basi bractea foliacea instructis, pedicellis inferne articulatis basi bracteatis sub anthesin 4–5 mm. mox ad 9 mm. longis; flores lutei (ex *Kerr*). *Sepala* 5, oblongo-lanceolata, obtusa, 5·5 mm. longa, 2 mm. lata, dorso medio viridia, pallide marginata. *Petala* 5, oblongo-oblanceolata, 6 mm. longa, 2·5 mm. lata. *Antherae* sessiles, 5 mm. longae. *Ovarium* glabrum, stylo glabro stamina vix aequante.

Kaw Chang, Klawng Mayom, 10–350 m., evergreen forest, *Kerr* 6849.

Canarium venosum *Craib* [Burseraceae-Bursereae]; a *C. cinereo* Guillaumin stipulis petiolo saepissime adnatis, foliolorum nervis lateralibus magis numerosis, nervulis haud obscuris, corolla dimidio longiore differt.

Arbor circa 15 m. alta (ex *Kerr*); alabastra terminalia pallide ferrugineo-pilosa; ramuli primo tomentello-furfuracei, sulcati, cito plus minusve glabrescentes, cortice cinereo-brunneo obtecti,

lenticellis interdum conspicuis. *Folia* 3–7-foliolata, 15–30 cm. (petiolo 6–10 cm. longo incluso) longa, et petiolo et rhachi maturis puberulis vel supra apicem versus pilosulis plus minusve striatis; stipulae integrae, angustae, 10–14 mm. longae, fere ad medium petiolo adnatae, indumento ei ramulorum simili tectae; foliola oblonga vel oblongo-lanceolata, terminali saepe oblongo-oblanceolato, apice acuminata vel subacuminata, costa breviter excurrente notata, basi inferiora aequaliter vel subaequaliter rotundata vel truncata, superiora saepe conspicue inaequilateralia, lateribus dimidiatim cuneata vel rotundato-cuneata, terminali basi aequaliter cuneato, 5·5–15 cm. longa, 2–4·8 cm. lata, coriaceo-chartacea, sicco viridia, subtus pallidiora, supra ad costam pubescentia vel pilosa, aliter puberula, subtus densius puberula, nervis lateralibus utrinque 14–20 supra conspicuis vel subprominulis subtus prominentibus, nervulis rete gracile subtus magis prominulum efficientibus, margine denticulata, lateralia inferiora petiolo ad 8 mm. longo suffulta, superiora in foliis 5–7-foliolatis saepissime sessilia, terminali a lateralibus circa 2 cm. distante. *Paniculae* masculae thyrsoideae, circa 15 cm. (pedunculo communi circa 5 cm. longo incluso) longae, et pedunculo et rhachi crispatim pilosulis; cymae ad 3 cm. inter se distantes, pedunculo ad 6 mm. longo suffultae, bracteis deciduis; pedicelli ad 2 mm. longi, basi bracteati. *Calyx* 2·5 mm. longus, apice 3-undulatus, ciliatus, extra griseo- vel subferrugineo-pubescens. *Petala* 3, circa 9 mm. longa et 1·75 mm. lata, superne incrassata, extra breviter griseo-pubescentia, inferne glabrescentia, intra glabra. *Filamenta* 6·5 mm. longa, glabra, inferne parum ampliata, basi ad 2 mm. coalita, antheris 1·75 mm. longis glabris apiculatis.

Dan Sai, Hui Nam Man, 600 m., savannah forest, *Kerr* 5814.

Chisocheton siamensis *Craib* [Meliaceae-Trichilieae]; a *C. paniculato* Hiern foliolis maioribus, pedicellis brevioribus inter alia recedit.

Arbor circa 8 m. alta (ex *Kerr*); ramuli validi, crassius sulcati vel compressi, iuventute dense adpresse pubescentes, mox glabri, fusci, lenticellis hic et illic conspicuis. *Folia* ad 63 cm. (petiolo ad 18 cm. longo incluso) longa, petiolo basi incrassato inferne glabro, rhachi superne densius fulvo-pubescente inferne cum petioli parte superiore puberulo; foliola 4–9-iuga, inferiora alterna, superiora opposita, oblonga vel elongato-oblonga, apice acuminata, basi inaequilateralia, latere altero dimidiatim rotundata, altero dimidiatim rotundata vel subcuneata, ad 24 cm. longa et 7 cm. lata, chartacea, supra tantum ad costam vel etiam ad nervos laterales pubescentia, subtus ad costam nervosque laterales pubescentia, aliter parce pubescentia, nervis lateralibus utrinque circa 15 intra marginem anastomosantibus supra plus minusve conspicuis subtus prominentibus, nervis transversis pagina utraque conspicuis, margine integra, recurva, petiolulis circa 5 mm. longis dense pubescentibus sat validis suffulta. *Paniculae* iuventute densius

pubescentes, mox plus minusve glabrescentes, circa 50 cm. longae, pedunculo communi circa 6 cm. longo suffultae, ramis inferioribus circa 20 cm. longis, pedicellis 2 mm. longis. *Calyx* 4-lobulatus, 1·5 mm. longus. *Petala* 4–6, circa 18·5 mm. longa, 1·75 mm. lata, extra apicem versus puberula. *Tubus staminalis* 17 mm. longus, apice 6-dentatus, extra superne hirsutus, intra medium versus pilis paucis instructus; antherae 6, dorso pilis paucis sat longis instructae. *Discus* 0·5 mm. altus, glaber. *Ovarium* circa 1 mm. altum, hirsutum; stylus 17·5 mm. longus, nisi apicem versus hirsutus, stigmate capitato.

Chiengmai, 650 m., evergreen jungle, *Winit* 1136. Mê Hawng Sawn, Mê Mue, 500 m., evergreen forest by stream, *Kerr* 6171 (*type*).

Aglaia marginata *Craib* [Meliaceae-Trichilieae]; ab *A. cinerea* King foliolis magis numerosis oppositis saepissime oblanceolatis recedit.

Arbor circa 15 m. alta (ex *Kerr*); ramuli iuventute squamulis stellatis dense ferrugineo-furfuraceo-tomentelli, demum glabrescentes, cortice cinereo-brunneo obtecti, lenticellis numerosis haud conspicuis. *Folia* petiolo 4–7·5 cm. longo incluso 13–36 cm. longa, petiolo basi incrassato cum rhachi supra canaliculato indumento ei ramulorum simili tecto suffulta; foliola 5–11, opposita vel infima subopposita, saepissime oblanceolata, inferioribus saepe oblongis et aliis paulo minoribus, apice breviter acuminata, basi lateralia inaequaliter cuneata, terminali aequaliter attenuato-cuneata, usque ad 18 cm. longa et 5 cm. lata, rigide chartacea, supra glabra vel ad costam impressam squamis stellatis ferrugineis instructa, subtus pallidiora, ad costam nervosque laterales indumento ei ramulorum simili tecta, plus minusve glabrescentia, nervis lateralibus utrinque 11–18 rectis vel subrectis intra marginem sursum curvatis supra conspicuis saepe parum impressis subtus prominentibus, nervulis vix conspicuis, integra, petiolulo circa 7 mm. longo supra canaliculato suffulta, terminali a lateralibus 1–2 cm. distante. *Paniculae* ad apices ramulorum positae, axillares, ad 30 cm. (pedunculo communi 3–4 cm. longo incluso) longae, ramis inferioribus ad 9 cm. longis plus minusve patulis, partibus omnibus indumento ei ramulorum simili instructae; flores lutei (ex *Kerr*), primo congesti, sub anthesin laxiusculi, pedicellis ad 2 mm. longis suffulti. *Sepala* variabilia, saepissime 4, deltoidea vel lineari-oblonga, obtusa, 0·75–1·5 mm. longa, extra pilis stellatis ferrugineis tecta, intra glabra, ciliata. *Petala* 5, variabilia, ovata, obovata, vel oblonga, ad 1·5 mm. longa et 1 mm. lata, glabra. *Tubus staminalis* 0·5 mm. longus, inferne contractus, apice 1 mm. diametro; antherae 5, circa 0·3 mm. longae, ad tubi apicem insertae, exsertae. *Ovarium* breve, pilosum, stylo brevi, stigmate subellipsoideo.

Pattani, Kao Kalakiri, 700 m., evergreen forest, *Kerr* 7809.

Aglaia oblanceolata *Craib* [Meliaceae-Trichilieae]; species *A. repoeunsi* Pierre habitu similis sed ob petiolum alatum *A. odoratae* Lour. affinis, ab hac foliis diversis recedit.

Frutex circa 4 m. altus vel arbor ad 10 m. alta (ex *Kerr*); ramuli iuventute squamulis stellatis ferrugineis subdense tecti, mox glabri, cortice cinereo-brunneo vel cinereo obtecti, lenticellis mox conspicuis prominentibus. *Folia* 5-foliolata, ad 16 cm. (petiolo ad 3 cm. longo incluso) longa, et petiolo et rhachi anguste alatis cito glabris; foliola saepissime oblanceolata, apice breviter obtuse acuminata vel subacuminata, basi attenuato-cuneata, ad 11 cm. longa et 3·7 cm. lata, rigide chartacea, sicco viridia, subtus pallidiora, glabra, nervis lateralibus utrinque circa 8 intra marginem anastomosantibus supra subconspicuis subtus prominentibus, nervulis rete gracile supra interdum conspicuum subtus prominulum efficientibus, integra, petiolulo 1–2 mm. longo suffulta. *Paniculae* axillares, foliis parum breviores, glabrae; bracteae parvae, deciduae; pedicelli circa 1 mm. longi. *Sepala* 5, circa 0·5 mm. longa, glabra. *Petala* 5, oblonga, apice rotundata, 2·25 mm. longa, 1·5 mm. lata, glabra. *Tubus staminalis* circa 1·25 mm. longus, inferne angustatus, 5-angulatus, antheris 5 inclusis 0·75 mm. longis. *Pistillodium* columnare, apicem versus breviter pubescens. *Fructus* brunneus, saepissime ellipsoideus, ad 1·3 cm. longus, squamulis stellatis ferrugineis subsparse tectus.

Kampêng, mixed jungle, *Kerr* 2032. Between Kampêng and Paknampo, 90 m., near a village, *Kerr* 3001. Nakawn Sawan, Mê Wong, 200 m., mixed deciduous forest, *Kerr* 6034 (*type*).

Walsura angulata *Craib* [Meliaceae-Trichilieae]; ab affini *W. robusta* Roxb. petiolo lateraliter conspicue angulato, filamentis haud liberis facile distinguenda.

Arbor circa 10 m. alta (ex *Kerr*); ramuli puberuli, mox glabri, plus minusve angulati, cortice cinereo vel pallide cinereo obtecti, lenticellis inconspicuis. *Folia* 9·5–22 cm. (petiolo 1·5–4 cm. longo supra subplano conspicue lateraliter angulato incluso) longa, glabra; foliola 5, rarissime 3, oblonga vel subelliptica, vel terminalia oblongo-oblanceolata vel obovata, apice acuminata, basi cuneata vel rotundata, 5·5–13 cm. longa, 2–5 cm. lata, chartaceo-coriacea, subtus pallidiora, nervis lateralibus utrinque 7–10 gracilibus supra conspicuis vel subprominulis subtus prominentibus, nervulis copiosis supra subconspicuis subtus conspicuis, integra, petiolulo 5–12 mm. longo supra canaliculato suffulta, terminali a lateralibus usque ad 3 cm. distante. *Paniculae* 2–3, in ramulis hornotinis racemosim dispositae, ex axillis foliorum bracteiformium ortae, ad 12 cm. (pedunculo communi circa 3 cm. longo incluso) longae, ramis inferioribus ad 4 cm. longis, puberulae; bracteae angustae, 2 mm. longae, deciduae; pedicelli 3 mm. longi, infra medium articulati. *Sepala* exteriora oblongo-ovata, interiora ovata, acutiuscula, ad 2 mm. longa et 1·25 mm. lata, basi breviter connata, dorso puberula, ciliolata. *Petala* 5, oblongo-oblanceolata

vel oblonga, obtusa vel obtuse acuminata, 4 mm. longa, 2·25 mm. lata, extra puberula, intra glabra, ciliolata. *Stamina* 3 mm. longa; filamenta complanata, basi usque ad medium vel saltem ad partem trientem connata, utrinque inferne glabra, superne parce pilosa, apice bidentata, antheris sicco fuscis ad 0·75 mm. longis. *Ovarium* disco glabro immersum, cum stylo parcius puberulum.

Sriracha, Nawng Kaw, 50 m., evergreen forest, *Kerr* 6793.

Walsura intermedia *Craib* [Meliaceae-Trichilieae]; a *W. hypoleuca* Kurz foliis multo minoribus, filamentis haud liberis, ovario subglabro, a *W. cochinchinense* Harms foliolis minoribus, paniculis multo maioribus recedit.

Arbor circa 20 m. alta (ex *Kerr*); alabastra terminalia dense pallide ferrugineo-tomentella; ramuli iuventute angulati, ferrugineo-puberulo-furfuracei. *Folia* 3–5-foliolata, 11–28 cm. (petiolo 3–5·5 cm. longo incluso) longa, petiolo et rhachi supra canaliculatis indumento ei ramulorum simili iuventute tectis; foliola lanceolata, apice acute acuminata vel subacuminata, basi cuneata, 5–16 cm. longa, 1·6–4·3 cm. lata, rigide chartacea, mox glabra, subtus primo saltem ad costam crispatim puberula, supra viridia, subtus pallida, nervis lateralibus utrinque 10–15 supra conspicuis subtus prominentibus, nervulis utrinque conspicuis, margine integra, recurva, lateralia petiolulo 5–8 mm. longo primo puberulo suffulta, terminali a lateralibus 2–3 cm. distante. *Paniculae* ad 17 cm. (pedunculo communi ad 11·5 cm. longo incluso) longae; pedunculi partiales infimi 2–3 cm. longi, paniculam partialem circa 1 cm. longam et 1·5 cm. latam gerentes, pedunculis et rhachi puberulis; pedicelli vix 3 mm. longi, puberuli, basi bracteati. *Sepala* deltoidea, subacuta, 1·5 mm. longa, 1 mm. lata, extra parce pubescentia, intra parce puberula, ciliata. *Petala* oblonga, apice acutiuscula, 3·5 mm. longa, 1·5 mm. lata, extra densius puberula, intra breviter sparsius puberula. *Filamenta* ad 2·5 mm. longa, inferne vix ad medium connata, saltem longiora apice bidentata, extra parce sed conspicue pilosa, margine et intra pilosa, complanata, antheris 1 mm. longis apiculatis puberulis. *Discus* conspicuus, fere glaber. *Ovarium* immersum, cum stylo parce puberulum vel subglabrum.

Nan, Doi Pu Ka, 1200 m., evergreen forest, *Kerr* 4959.

Walsura pallida *Craib* [Meliaceae-Trichilieae]; frutex ramulis fere glabris, foliis 5–7-foliolatis, foliolis subtus pallidis distinctus.

Frutex ad 1 m. altus (ex *Kerr*); ramuli iuventute glabri vel pilis hic et illic sparse instructi, virides, angulati, mox omnino glabri, cortice rubro-brunneo vel cinereo-brunneo obtecti. *Folia* 5–7-foliolata, ad 25 cm. (petiolo ad 8·5 cm. longo incluso) longa, petiolo subterete vel superne cum rhachi late sulcato glabro; foliola oblonga, ovata, vel lanceolato-ovata, apice acute acuminata, basi interdum parum inaequilateralia, cuneata vel rotundata, 6–9·5 cm.

longa, 2·5–4·2 cm. lata, rigide chartacea, supra viridia, subtus pallida, iuventute subtus pilis paucis adpressis instructa, cito omnino glabra, nervis lateralibus utrinque 8–10 intra marginem anastomosantibus supra impressis subtus prominentibus, nervulis fere omnibus obscuris, integra, petiolulo 3–10 mm. longo supra canaliculato suffulta. *Paniculae* in ramis hornotinis racemosim dispositae, inferiores ex axillis foliorum delapsorum, superiores ex axillis foliorum iuvenilium ortae, glabrae, pedunculo communi ad 3 cm. longo glabro suffultae, 1 cm. longae, 1·5 cm. diametro, pedunculis partialibus usque ad 7 mm. longis, pedicellis 1–1·5 mm. longis basi articulatis, bracteis parvis. *Sepala* oblata, imbricata, circa 1·25 mm. longa et 1·75 mm. lata, pauperius ciliolata. *Petala* oblongo-elliptica, 4 mm. longa, 2–2·5 mm. lata, ciliolata. *Stamina* circa 3 mm. longa; filamenta inferne connata, apice bilobata, lobis antheras paululo superantibus vel saltem eis subaequialtis denticulatis, glabra vel saltem longiora pilis paucis sat rigidis infra antheras ipsas intra instructa. *Discus* glaber. *Ovarium* glabrum, disco immersum.

Dan Sai, Hui Nam Man, 600 m., deciduous forest, *Kerr* 5813.

Dichapetalum Kerrii *Craib* [Chailletiaceae]; ab affini *D. monosperma* Merrill ramulis et foliis iuvenilibus magis pubescentibus inter alia differt.

Arbor 6–7-metralis (ex *Kerr*); ramuli graciles, iuventute dense adpresse pubescentes, mox glabrescentes, cortice pallide brunneo plus minusve conspicue lenticellato obtecti. *Folia* oblongo-oblanceolata vel oblongo-elliptica, apice acuminata vel saepius caudato-acuminata, summo apice costa excurrente notata, saepe retusa, basi saepe inaequilateralia, cuneata vel acuminato-cuneata, 8·5–12 cm. longa, 2·5–4·8 cm. lata, chartacea vel rigide chartacea, sicco pallide viridia, costa supra adpresse hirsuta vel mox fere glabra, aliter glabra, subtus ad costam nervosque laterales pilis sat longis et rigidis plus minusve adpressis primo dense demum sparse instructa, nervis lateralibus utrinque 5–6 arcuatis vel oblique arcuatis supra gracilibus subprominulis subtus prominentibus, nervulis rete gracile supra parum conspicuum subtus prominulum efficientibus, iuventute ciliata, mox distanter ciliata, petiolo 3–4 mm. longo adpresse hirsuto suffulta; stipulae deciduae, subulatae, 5 mm. longae. *Cymae* in ramulis hornotinis gestae, axillares vel ex axillis foliorum delapsorum ortae, circa 7 mm. (pedunculo communi circa 2 mm. longo incluso) longae; pedicelli breves. *Sepala* exteriora oblongo-ovata, obtusa, 2·75 mm. longa, interiora oblonga, paululo longiora, dorso breviter adpresse pubescentia, ciliata. *Petala* ligulata, 3·5 mm. longa, apice 1 mm. lata, bilobata, glabra. *Stamina* petalis aequilonga, filamentis glabris complanatis, antheris circa 0·6 mm. longis. *Disci* glandulae 5, globosae, glabrae. *Pistillodium* dense albo-pilosum.

Nakawn Sawan, Mê Wong, 200 m., evergreen forest, *Kerr* 6036.

Mappia dimorpha *Craib* [Icacinaceae]; ab affini *M. cambodiana* Pierre foliis basi cuneatis, calycis lobis pro rata brevioribus, petalis longioribus recedit.

Arbor circa 10 m. alta (ex *Kerr*); ramuli iuventute adpresse hirsuto-pubescentes, annotini glabri vel glabrescentes, cortice stramineo longitudinaliter rugato obtecti, foliorum cicatricibus prominentibus. *Folia* inferiora subopposita, superiora alterna, elliptica vel oblongo-elliptica, apice angustata vel subacuminata, basi cuneata, ad 18 cm. longa et 8·7 cm. lata, membranacea, supra ad costam nervosque laterales pilis rigidis breviusculis crispatis densius tecta, aliter pilis similibus hic et illic instructa, subtus parum pallidiora, molliter pubescentia, nervis lateralibus utrinque 8–10 obliquis intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervulis subtus prominulis, margine integra, ciliata, petiolo 3–5 cm. longo pubescente supra canaliculato suffulta. *Inflorescentia* terminalis, corymbosa, 10 cm. lata, pedunculo communi 8 cm. longo suffulta, adpresse crispatim pubescens, bracteis parvis, floribus pallide viridibus (ex *Kerr*) sessilibus vel breviter pedicellatis. *Calyx* 1·5 mm. longus, ad medium lobatus, dorso adpresse pubescens. *Petala* 4·5 mm. longa, 1·5 mm. lata, basi inter se leviter cohaerentia, extra adpresse pubescentia, intra basi excepta pilosa. *Filamenta* vix 3 mm. longa, vel interdum petala superantia, glabra; antherae vix 1 mm. longae. *Discus* brevis, ovarii basem cingens, glaber. *Ovarium* 1 mm. altum, dense pubescens, stylo 2 mm. longo glabro vel pistillo filamentis vix aequilongo.

Sukotai, 50 m., mixed deciduous forest, *Kerr* 5952.

Euonymus carinatus *Craib* [Celastraceae-Celastreae]; ab *E. cochinchinense* Pierre capsulae valvis dorso obtuse carinatis haud rotundatis recedit.

Ramuli primo sicco virides, canaliculati, parum compressi, mox teretes, cortice cinereo-brunneo obtecti, lenticellis prominulis. *Folia* oblonga, oblongo-oblanceolata vel elliptica, apice obtuse acuminata, basi cuneata vel late cuneata, 7·5–14 cm. longa, 3·3–6·7 cm. lata, chartacea vel coriaceo-chartacea, sicco viridia, subtus pallidiora, glabra, nervis lateralibus utrinque 6–7 intra marginem anastomosantibus pagina utraque gracilibus prominulis, nervulis laxis mox subtus prominulis et supra plus minusve conspicuis, margine inferne integra, apicem versus serrulata, petiolo circa 4 mm. longo supra conspicue canaliculato suffulta. *Cymae* axillares, pedunculo communi 3·5–6·5 cm. longo basi squamis ferrugineo-pilosis instructo suffultae; pedunculi partiales 13–22 mm. longi, pedicellis circa 4 mm. longis, omnibus glabris. *Sepala* 5, rotundata vel oblata, apice rotundata, 1–1·75 mm. longa, 1·75–3 mm. lata, fimbriato-ciliolata. *Petala* 5, suborbicularia vel oblata, basi in stipitem brevem latum angustata, circa 4 mm. longa, 3·75–5 mm. lata, denticulata vel auguste fimbriata. *Filamenta* brevia. *Ovarium* glabrum, apice 5-rugatum. *Capsula* ad 12 mm.

longa, apice concava, 12 mm. diametro, lobis 5 dorso obtuse carinatis.

Sriracha, Nawng Kaw, *Mrs. D. J. Collins* 153. Sriracha, Nawng Pru, Ban Dan railhead, evergreen forest, *Mrs. D. J. Collins* 842 (*type*).

Euonymus colonoides *Craib* [Celastraceae-Celastreae]; species *E. simili* Craib habitu similis sed foliis longius petiolatis, nervis lateralibus magis numerosis et magis prominentibus, floribus minoribus, *E. grandifloro* Wall. fructu similis sed fructu minus prominenter rugato, foliis maioribus haud obovatis differt.

Arbor circa 12–15 m. alta (ex *Kerr*); ramuli sicco iuventute pallide virides, glabri, parum compressi, anguste sed conspicue bicanaliculati, mox teretes, pallide brunneo-corticati, lenticellis rotundatis parum prominulis hic et illic verruculosi. *Folia* oblongo-lanceolata vel oblongo-elliptica, apice obtuse subacuminata, basi cuneata vel rotundato-cuneata, 9–16 cm. longa, 4–7 cm. lata, chartaceo-coriacea vel subcoriacea, sicco viridia, subtus pallidiora, glabra, nervis lateralibus utrinque 8–10 intra marginem sursum curvatis et anastomosantibus supra gracilibus prominulis subtus prominentibus, nervulis tantum paucis conspicuis, margine recurva, subintegra vel apicem versus paucidenticulata, petiolo ad 18 mm. longo supra canaliculato suffulta. *Cymae* pedunculo communi 2–4 cm. longo suffultae; pedunculi partiales 6-10 mm. longi, pedicellis 3–3·5 mm. longis, omnibus glabris sicco pallide viridibus. *Sepala* 1·5–2 mm. longa. *Petala* obovata, 3 mm. longa, 2·5 mm. lata, fimbriata. *Stylus* brevis. *Fructus* ellipsoideo-turbinatus vel subellipsoideus, apice truncatus, ad 1 cm. longus et apice 1·2 cm. diametro, glaber, plus minusve transverse corrugatus, anguste 5-alatus.

Doi Sutep, 1670 m., evergreen forest, *Kerr* 3194 (*type*). Doi Angka, 1500 m., evergreen forest, *Kerr* 6342.

Euonymus ligustrinus *Craib* [Celastraceae-Celastreae]; *E. Dielsiano* Loes. habitu valde similis sed petalis denticulatis, ab *E. attenuato* Wall. foliis haud integris recedit.

Frutex circa 4 m. altus (ex *Kerr*); ramuli glabri vel iuventute apice tantum pilis perpaucis cito deciduis instructi, primo bicanaliculati et parum compressi, cito teretes, virides. *Folia* lanceolata, apice obtuse acuminata et costa excurrente breviter apiculata, basi cuneata, 4–9 cm. longa, 1·5–3 cm. lata, primo chartacea, mox subcoriacea, glabra, nervis lateralibus utrinque circa 6 supra conspicuis vel subobscuris subtus tenuibus prominulis, nervulis obscuris, margine saltem superne plus minusve denticulata vel anguste serrulata, petiolo ad 5 mm. longo suffulta. *Cymae* axillares, 7-florae, pedunculo communi 1–2 cm. longo glabro viridi basi bracteis ferrugineo-pilosis circa 2 mm. longis angustis et apice bracteis duabus 1 mm. longis ferrugineo-pilosis instructo suffultae; pedunculi partiales 2–5 mm. longi, glabri; pedicelli 2 mm. longi,

glabri. *Sepala* ovato-oblata vel oblata, apice rotundata, circa 1·5 mm. longa et 2·5 mm. lata, ciliolata. *Petala* subrotundata, circa 3 mm. diametro, basi in stipitem latum angustata, margine fimbriato-denticulata, ciliolata. *Filamenta* brevia. *Ovarium* glabrum, apice 5-rugatum, stylo brevi.

Nakawntai, 200 m., evergreen forest, *Kerr* 5852.

Microtropis crassifolia *Craib* [Celastraceae-Celastreae]; species nova foliis parvis crassis, nervis lateralibus omnino vel fere omnino obscuris, capsula stylo persistente apiculata distincta.

Arbuscula 4–5 m. alta (ex *Kerr*), calyce excepto glabra; ramuli iuventute graciles, cito purpurascentes, angulati, demum cortice cinereo vel cinereo-purpureo obtecti. *Folia* oblongo-elliptica, lanceolata, vel subovata, apice obtuse breviter acuminata, basi acuminata, cuneata, vel late cuneata, 4–8 cm. longa, 1·4–4 cm. lata, crassa, subtus pallidiora, costa pagina utraque plus minusve prominente, nervis lateralibus saepissime omnino obscuris utrinque circa 6–8, margine integra, anguste recurva, petiolo 2–7 mm. longo supra canaliculato suffulta. *Capsulae* solitariae vel geminae, sessiles vel breviter pedunculatae, ad 1·8 cm. longae, virides vel purpureo-virides, stylo brevi persistente apiculatae, basi sepalis fimbriato-ciliatis late pallide marginatis cinctae; semina solitaria, rubro-arillata.

Chantabun, Kao Soi Dao, 1300 m., evergreen forest, *Kerr* 9665 (*type*). Korat, Kao Lêm, 1000 m., evergreen forest, *Kerr* 9923.

Celastrus approximata *Craib* [Celastraceae-Celastreae]; ab affinibus *C. stylosa* Prain et *C. Hindsii* Benth. nervulis multo magis approximatis recedit.

Ramuli glabri, primo virides, sulcati, basi squamosi, mox teretes, cortice rubro vel fusco-rubro obtecti, lenticellis haud conspicuis. *Folia* alterna, saepissime oblonga vel elliptica, apice acuminata, basi cuneato-rotundata, rarius cuneata vel rotundata, 7–15 cm. longa, 3–8 cm. lata, primo chartacea, demum coriacea, sicco subviridia, subtus pallidiora, nervis lateralibus utrinque 7–9 intra marginem longius sursum curvatis supra conspicuis subtus prominentibus, nervulis rete transverse elongatum pagina utraque mox prominulum efficientibus, margine recurva, serrulata, petiolo 5–10 mm. longo supra canaliculato suffulta. *Cymae* ex axillis novellis ortae, pedunculo communi incluso 10–15 mm. longae et ramulos novellos terminantes ubi paniculam racemiformem ad 4 cm. longam e cymis compositam formantes, rarius ex axillis vetustioribus ortae paniculam similem ad 5 cm. longam efficientes; pedunculus communis circa 5 mm. longus, pedunculis partialibus circa 2 mm. longis, pedicellis 2 mm. longis apice articulatis, omnibus glabris; flores virides (ex *Kerr*). *Calyx* vix 2 mm. longus, lobis imbricatis rotundatis ciliolatis. *Petala* 5, oblonga, apice rotundata, 3 mm. longa, 1·75 mm. lata, ciliolata. *Discus* brevis, pallidus, glaber. *Filamenta* pallida,

glabra, ad 0·5 mm. longa, antheris apiculatis filamentis paulo longioribus. *Stylus* brevis, crassus, stigmate stylo latiore 3-lobulato; ovarium 3-loculare, loculis 2-ovulatis.

Korat, Kao Lêm, 1100 m., evergreen forest, *Kerr* 9941.

Gymnosporia Marcanii *Craib* [Celastraceae-Celastreae]; a *G. Wallichiana* Lawson inter alia fructu multo minore recedit.

Arbor 3–5 m. alta; ramuli glabri, iuventute obtuse angulati, brunneo-corticati, mox teretes, cinereo-corticati, spinis rigidis 1–1·5 cm. longis armati. *Folia* obovata, apice saepissime emarginata, rarius rotundata, basi longius acuminato-cuneata vel cuneata, 3·5–9·5 cm. longa, 2·5–5·5 cm. lata, coriacea, glabra, nervis lateralibus utrinque circa 5 pagina superiore plus minusve conspicuis inferiore prominulis intra marginem anastomosantibus, margine serrulato-crenata vel crenulata, petiolo 3–10 mm. longo suffulta. *Cymae* axillares, fasciculatae, circa 1·5 cm. longae, pedunculo communi brevi vel ad 5 mm. longo glabro suffultae, bracteis 1·5 mm. longis fimbriato-ciliatis, pedicellis 3–5 mm. vel infructescentibus 8 mm. longis glabris paulo supra basem articulatis. *Sepala* ovata, obtusa, circa 1 mm. longa et lata, fimbriato-ciliolata, aliter glabra. *Petala* oblonga, apice rotundata, 4 mm. longa, glabra, apicem versus pauci-denticulata. *Filamenta* 2·5 mm. longa, glabra, basi complanata, antheris 0·75 mm. longis apiculatis. *Discus* carnosus, glaber. *Ovarium* vix 0·75 mm. longum, apice rotundatum vel subtruncatum, stigmatibus 3 brevibus. *Capsula* circa 8 mm. longa, 3-locularis, viridi-straminea, glabra, seminibus rubro-brunneis circa 5 mm. longis basi arillatis.

Hua Hin, 2 m., *Marcan* 393 (*type*). Korat, Chan Tûk, savannah, *Kerr* 8074.

Hippocratea pallida *Craib* [Hippocrateaceae]; species ramulis pallidis dense verruculosis, foliis parvis, inflorescentia plus minusve puberula distincta.

Frutex volubilis; ramuli glabri, primo fusco-brunnei et plus minusve verruculosi, mox substraminei vel saepius pallidi, dense verruculosi. *Folia* opposita, elliptico-ovata, subelliptica vel rarius suboblonga, apice breviter obtuse acuminata vel rotundata, basi interdum inaequilateralia, rotundata vel cuneata, 4–6·5 cm. longa, 2·4–3·8 cm. lata, chartacea vel coriaceo-chartacea, glabra, sicco viridia, nervis lateralibus utrinque circa 6 intra marginem anastomosantibus pagina utraque prominulis, nervulis paucis pagina utraque subprominulis, margine inconspicue distanter denticulata, petiolo 4–6 mm. longo supra canaliculato suffulta. *Cymae* vel axillares, circa 3 cm. (pedunculo communi circa 1·7 cm. longo incluso) longae vel saepissime in paniculam efoliatam ad 30 cm. longam ramulis oppositis 7–12 cm. longis dispositae, saltem pedunculis ultimis puberulis; pedicelli 1·5 mm. longi, densius puberuli; alabastra suboblonga, obtusa, circa 3·5 mm. longa; flores virides (ex *Kerr*). *Sepala* 5, sat crassa, circa 0·75 mm.

longa, extra puberula, ciliolata. *Petala* 5, oblongo-lanceolata, apice plus minusve cucullata, apiculata, 4·5 mm. longa, 2 mm. lata, breviter ciliolata, extra breviter sparse puberula, intra glabra. *Stamina* 3, filamentis 2 mm. longis complanatis glabris, antherarum loculis divergentibus. *Ovarium* 3-loculare, loculis 6–8-ovulatis.

Chaibadan, Dong Pya Yen, 100 m., evergreen forest, *Kerr* 8016.

Hippocratea puberula *Craib* [Hippocrateaceae]; species *H. dinhensi* Pierre habitu similis sed inflorescentia haud glabra distinguenda.

Frutex volubilis; ramuli glabri, primo parum complanati et conspicue bicanaliculati, subvirides, mox teretes, cortice cinereo-brunneo vel subfusco obtecti, lenticellis parvis rotundatis numerosis prominulis. *Folia* opposita vel subopposita, oblonga vel rarius ovato-oblonga, apice saepissime breviter obtuse acuminata, basi saepissime parum inaequilateralia, cuneata, rotundato-cuneata vel rotundata, 8–17 cm. longa, 4–8 cm. lata, chartaceo-coriacea vel mox coriacea, glabra, sicco subviridia, nervis lateralibus utrinque 6–9 intra marginem anastomosantibus supra conspicuis vel saepissime prominulis subtus prominentibus vel subprominentibus, nervulis pagina utraque conspicuis, margine serrulato-crenata, petiolo 10–15 mm. longo supra anguste sed altius canaliculato suffulta. *Cymae* paniculas ex axillis iunioribus ortas 4–5 cm. longas formantes; pedunculus communis 2·5–3 cm. longus, sulcatus, puberulus, apice bracteis duabus circa 1·5 mm. longis deciduis instructus; pedunculi partiales circa 8 mm. longi, crispatim puberuli; pedicelli 6 mm. longi, puberuli; flores virides (ex *Kerr*). *Sepala* 5, rotundato-deltoidea, obtusa, circa 1 mm. longa, paululo latiora quam longiora, sat crassa, dorso puberula, ciliolata. *Petala* 5, lanceolata vel oblongo-lanceolata, apice incrassata, cucullata, apiculata, ad 4·5 mm. longa, 2 mm. lata, extra densius puberula, intra sparse puberula vel subglabra. *Discus* vix 1·5 mm. altus, glaber, carnosus, plus minusve lobulatus. *Stamina* 3, filamentis complanatis circa 1 mm. longis, antherarum loculis divergentibus. *Pistillum* staminibus subaequialtum, glabrum; ovarium 3-loculare, loculis 8-ovulatis, ovulis biseriatis.

Mûang Pai, Hui Mé Na, 900 m., evergreen forest near stream, *Kerr* 5503.

Hippocratea sulcata *Craib* [Hippocrateaceae]; ab affini *H. Chesseana* Pierre foliis angustioribus, petiolo supra canaliculato, inflorescentia magis ramosa recedit.

Ramuli volubiles, iuventute crispatim puberuli, brunnei vel fusco-brunnei, pluri-sulcati et bicanaliculati, mox glabrescentes, cortice fusco vel cinereo obtecti. *Folia* lanceolata, apice obtuse acuminata, basi cuneata, 7–11 cm. longa, 2–3·7 cm. lata, coriacea, glabra, nervis lateralibus utrinque 8–10 intra marginem anastomosantibus pagina utraque gracilibus prominulis, nervulis rete

gracile pagina utraque prominulum efficientibus, margine anguste serrulato-crenata, inferne integra, petiolo 4–6 mm. longo supra canaliculato suffulta. *Cymae* paniculas ex axillis apicalibus ortas 3–6·5 cm. longas formantes; pedunculus communis ad 1 cm. longus, densius breviter ferrugineo-pubescens; pedunculi partiales utrinque 2–4, ad 1·5 cm. longi, similiter tecti; pedicelli usque ad 4 mm. longi, densius breviter griseo-pubescentes; flores virides (ex *Kerr*). *Sepala* 5, late deltoidea, obtusa, vix 1·5 mm. longa, 1·5 mm. lata, sat crassa, extra puberula, ciliolata. *Petala* oblongo-lanceolata, apice paulo incrassata, plus minusve cucullata et apiculata, 4 mm. longa, 2 mm. lata, ciliolata. *Discus* carnosus, apice parce breviter pilosus. *Stamina* vix 1·5 mm. alta, glabra, filamentis complanatis, antherarum loculis divergentibus. *Ovarium* 3-loculare, loculis 6-ovulatis.

Kaw Chang, Klawng Mayom, 30 m., common in evergreen forest, *Kerr* 6927.

Salacia socia *Craib* [Hippocrateaceae]; ab affini *S. viminea* DC. foliis crassioribus latioribus recedit.

Arbuscula circa 4 m. alta (ex *Kerr*); ramuli primo angulati, mox teretes, cortice cinereo vel brunneo-cinereo obtecti, lenticellis vix conspicuis. *Folia* opposita vel alterna, late lanceolata, oblongo-elliptica, vel oblongo-oblanceolata, apice plus minusve acuminata, obtusa, basi cuneata vel subacuminata, 5–7 cm. longa, 2·3–3·5 cm. lata, coriacea, sicco supra plus minusve fuscescentia, subtus pallide viridia, nervis lateralibus utrinque circa 7 intra marginem anastomosantibus supra conspicuis subtus subprominentibus, nervulis rete subtus prominulum efficientibus, margine subintegra vel saepissime distanter serrulata, petiolo 3–5 mm. longo supra canaliculato suffulta. *Flores* axillares, in ramulis annotinis gesti, 3–5-fasciculati, pedunculo communi haud evoluto, pedicellis ad 5 mm. longis suffulti. *Sepala* 5, late deltoidea, obtusa, 1 mm. longa, 1·25 mm. lata, ciliolata. *Petala* 5, rotundato-elliptica vel subquadrata, apice rotundata, 5 mm. longa, 4 mm. lata, dorso concava, marginibus inferne reflexa. *Stamina* 3, circa 1·5 mm. longa, filamentis complanatis, antherarum loculis divergentibus. *Discus* glaber, carnosus, 1·5 mm. altus. *Ovarium* glabrum, trigonum, e disco exsertum, 3-loculare, loculis 2-ovulatis.

Nakawn Panom, Ta Uten, 200 m., open forest, *Kerr* 8437.

Salacia viridis *Craib* [Hippocrateaceae]; species nova foliis sicco viridibus, pedunculo communi evoluto, staminibus 3, ovarii loculis 4-ovulatis distincta.

Frutex volubilis; ramuli iuventute virides, plus minusve complanati, mox teretes, sulcati, cortice brunneo vel fusco-brunneo obtecti, lenticellis parvis inconspicuis. *Folia* opposita, oblonga vel elliptica, apice breviter acuminata, obtusa, basi rotundato-cuneata vel subtruncata, 7–14 cm. longa, 3–6·5 cm. lata, rigide chartacea, sicco viridia, supra nitida, subtus pallidiora, nervis

lateralibus utrinque 7–8 supra conspicuis subtus prominentibus, nervulis pagina utraque prominulis, margine anguste recurva, petiolo 7–13 mm. longo supra anguste sed conspicue canaliculato suffulta; stipulae parvae, cito deciduae. *Cymae* in ramulis hornotinis gestae, axillares, pedunculo communi circa 5 mm. longo primo suberecto vel patulo mox reflexo suffultae; pedicelli 2–3 mm. longi, glabri; flores virides (ex *Kerr*). *Calyx* 4·5 mm. diametro, sepalis imbricatis inter se inaequalibus rotundatis 1·5–2·25 mm. latis ciliolatis. *Petala* diu persistentia, patula, 3 mm. longa, 3·5 mm. lata, fimbriato-ciliolata. *Discus* glaber. *Stamina* 3, filamentis brevibus complanatis. *Ovarium* glabrum, 3-angulatum, stylo brevi, loculis tribus 4-ovulatis.

Pitsanulok, Nakawntai, 400 m., mixed forest by stream, *Kerr* 8889.

Tetrastigma bambusetorum *Craib* [Ampelidaceae]; species nova foliis saepissime unifoliolatis basi cordatis, petalis corniculatis apicem versus tantum papillosis distincta.

Caules inferne radicantes, circa 30 cm. longi, glabri, sicco plus minusve fuscescentes, longitudinaliter striati, parce lenticellati. *Folia* saepissime unifoliolata, interdum trifoliolata, unifoliolata ovata vel oblongo-ovata, apice acuminata, mucronata, basi cordata vel rotundata, 9–18 cm. longa, 10·5–12·5 cm. lata, trifoliolata e foliolis oblongis vel terminali oblongo-oblanceolato vel obovato-oblanceolato apice caudato-acuminatis basi terminali rotundato vel obtuse cuneato lateralibus inaequilateralibus latere altero rotundato-truncato altero rotundato-cuneato vel cuneato 9–17 cm. longis 3·5–7 cm. latis, lateralibus petiolulo 1 cm. longo suffultis, terminali a lateralibus 1·4–2 cm. distante, constituta, omnia chartacea, glabra, subtus pallidiora, e basi 5–7-nervia, nervis basalibus a lateralibus haud distinctis, nervis lateralibus utrinque circa 10 supra conspicuis subtus prominulis, nervulis paucis pagina utraque conspicuis, margine distanter interdum crassius denticulata; petiolus 8·5–12 cm. longus; stipulae deciduae; cirrhi haud evoluti. *Pedunculus* communis 3–8·5 cm. longus, bracteis duabus in partes tres saepissime divisus, apice subumbellatim ramosus, inflorescentiam 2–6 cm. diametro gerens, puberulus vel inferne glabrescens, pedunculis partialibus 1–1·5 cm. longis cum pedicellis 5–7 mm. longis puberulis; alabastra oblonga, apice corniculata. *Calyx* patelliformis, 1·75 mm. diametro, interdum vix denticulatus, interdum sublobulatus, pauperius ciliolatus, aliter glaber. *Petala* 4, apice cucullata, dorso corniculata, 3·5 mm. longa, 1·5 mm. lata, apicem versus dorso minute papillosa. *Filamenta* 2·5 mm. longa, antheris 0·75 mm. longis, loculis basi liberis. *Discus* undulatus. *Ovarium* apice subtruncatum, glabrum; stylus cylindricus vel subconicus, 0·5 mm. longus.

Lôi, Chiengkan, 200 m., bamboo jungle by dry stream, *Kerr* 8804.

Tetrastigma tenue *Craib* [Ampelidaceae]; a *T. dubio* Planchon inflorescentia haud glabra, a *T. rupestre* Gagnep. foliolis subtus glabris et ovario haud in stylum attenuato recedit.

Caulis erectus, circa 15 cm. altus vel ramosus et scandens; ramuli glabri, primo angulati, sulcati, cortice brunneo vel cinereo-viridi obtecti, lenticellis parvis subprominulis haud conspicuis. *Folia* uni- vel tri- foliolata, unifoliolata ovata vel lanceolato-ovata, apice subacuminata, mucronulata, basi cuneata, rotundata vel late rotundata, 6·5–17 cm. longa, 3·3–13 cm. lata, acute serrata vel saepius etiam trilobata, trifoliolata e foliolis lanceolatis oblongo-lanceolatis vel oblanceolatis apice subacuminatis mucronatis basi terminali cuneato lateralibus inaequilateralibus, latere exteriore rotundatis interiore cuneatis vel attenuatis, 5–15·5 cm. longis 2–6·5 cm. latis serratis, lateralibus petiolulo 2–5 mm. longo suffultis, terminali a lateralibus 0·6–2·5 cm. distante constituta, omnibus chartaceis sicco viridibus glabris nervis lateralibus utrinque 7–11 arcuatis supra conspicuis subtus prominulis; petiolus 1·5–8 cm. longus, glaber, supra canaliculatus; stipulae deciduae. *Inflorescentia* axillaris, subcorymbosa, e basi ramosa vel pedunculo communi circa 1 cm. longo suffulta, ad 2·5 cm. longa et 4 cm. lata, basi bracteata; pedicelli 2–5 mm. longi, cum pedunculis puberuli. *Calycis* lobi deltoidei, inter se subaequales, extra puberuli. *Petala* oblonga, apice cucullata, dorso infra apicem corniculata, 2·5 mm. longa, 1·5 mm. lata, extra puberula, intra glabra. *Filamenta* 1 mm. longa, glabra; antherae minute sparse puberulae. *Discus* quadratus, 4-lobulatus, glaber. *Ovarium* apice truncato-rotundatum, stylo distincto circa 0·6 mm. longo, stigmate 4-lobato, lobulis patulis angustis.

Udawn, Pu, 200 m., climbing on undergrowth in evergreen forest, *Kerr* 8605.

Ampelocissus changensis *Craib* [Ampelidaceae]; species foliis simplicibus parviusculis integris vel saepissime trilobulatis distincta.

Frutex cirrhosus; ramuli primo arachnoidei et puberuli, mox plus minusve glabrescentes, striati, cortice brunneo obtecti, lenticellis paucis haud conspicuis. *Folia* simplicia, ambitu elliptica vel late ovata, apice obtusa vel acuta, apiculata vel mucronulata, basi late cuneata vel truncata, saepissime trilobulata, lobulis nisi terminali haud ultra 1 cm. longis, ad 8·5 cm. longa et 5·3 cm. lata, chartacea vel rigide chartacea, sicco supra plus minusve viridia, subtus cinnamomea, supra mox sparse arachnoidea et papilloso-puberula, subtus dense arachnoidea et ad nervos breviter pilosa, nervis lateralibus utrinque circa 7 supra plus minusve conspicuis subtus prominulis, nervulis obscuris vel interdum subtus conspicuis, margine denticulata, petiolo ad 3·5 cm. longo supra canaliculato indumento ei ramulorum simili tecto suffulta; stipulae deciduae; cirrhi apud infructescentiam lignosi, ramulis similes, apice furcati. *Infructescentia* oppositifolia,

pedunculo lignoso ad 8·5 cm. longo ramulis simili suffulta, densa, globosa, circa 3 cm. diametro; pedicelli 3 mm. longi, glabri, pauci-lenticellati; fructus atro-purpureus (ex *Kerr*), circa 1 cm. longus; semina 7·5 mm. longa, dorso rotundata, intra medio longitudinaliter carinata.

Mê Chang, 300 m., deciduous forest, *Kerr* 3609.

Ampelocissus rupicola *Craib* [Ampelidaceae]; ab affini *A. divaricata* Planchon foliis multo minoribus recedit.

Ramuli arachnoidei et puberuli, iuventute sulcati, mox teretes, cortice brunneo obtecti, lenticellis haud conspicuis. *Folia* trifoliolata, petiolo ad 3 cm. longo indumento ei ramulorum simili obtecto suffulta; foliola terminalia oblonga, late lanceolata vel late oblanceolata, lateralia inaequilateralia, latere exteriore dimidiatim ovata, basi rotundata, interiore dimidiatim oblanceolata, basi cuneata vel rotundato-cuneata, omnia apice mucronulata, ad 4·5 cm. longa et 2·5 cm. lata, rigide chartacea, sicco supra griseo-viridia, subtus pallide cinnamomea, supra papilloso-puberula et parce arachnoidea, subtus dense arachnoidea et ad nervos breviter pubescentia, nervis lateralibus utrinque circa 6 subtus conspicuis, nervulis rete subtus plus minusve conspicuum efficientibus, margine irregulariter interdum conspicue interdum obsolete dentata, petiolulo ad 5 mm. longo suffulta, terminali a lateralibus ad 1 cm. distante; stipulae parvae, deciduae; cirrhi steriles iuventute integri, apud inflorescentiam apice biramosi. *Inflorescentia* densa, circa 8 mm. diametro, pedunculo communi 3·5 cm. longo etiam cirrhifero indumento ei ramulorum simili tecto suffulta; pedicelli circa 1 mm. longi, sparse pubescentes. *Calyx* 0·5–0·75 mm. longus, subtruncatus vel obsolete lobulatus, basi parce pubescens, superne glaber vel fere glaber, papilloso-ciliolatus. *Petala* 1·5 mm. longa, apice cucullata. *Filamenta* 0·75 mm. longa, glabra; antherae circa 0·4 mm. longae, paulo longiores quam latiores. *Discus* crenulatus. *Stigma* stylo brevi latius, circa 0·5 mm. diametro.

Sukotai, Kao Luang, 1000 m., trailing over rocks, *Kerr* 5942.

Cissus calcicola *Craib* [Ampelidaceae]; ab affini *C. repanda* Vahl ovario haud glabro distinguenda.

Ramuli iuventute dense cinnamomeo-tomentosi, mox glabri, cortice fusco-brunneo obtecti, teretes, longitudinaliter sulcati vel reticulato-sulcati. *Folia* iuvenilia rotundato-ovata, apice acute acuminata, basi altius cordata, ad 5·5 cm. longa et 4·2 cm. lata, subcrassa, supra primo dense cinnamomeo-pilosa, mox fuscescentia, sparsius ferrugineo-pilosa, subtus dense cinnamomeo-piloso-tomentosa, e basi 5-nervia, nervis secondariis (e costa ortis) utrinque 6 rectis ad marginem currentibus supra conspicuis subtus prominentibus, nervis transversis inter se parallelis sat numerosis supra parum impressis subtus prominulis, margine denticulata, petiolo circa 1·5 cm. longo indumento ei caulium simili obtecto suffulta.

Inflorescentia oppositifolia, corymbiformis, ad 6 cm. diametro, e cymis umbelliformibus ad 1·5 cm. diametro pedunculis ad 2 cm. longis suffultis constituta, pedunculo communi 3–4 cm. longo suffulta, partibus omnibus cinnamomeo-pilosa; pedicelli sub anthesin 4 mm. longi, mox circa 7 mm. longi. *Petala* 4, dorso brunneo-pilosa, 3 mm. longa, 1·5 mm. lata. *Filamenta* 2·5 mm. longa, antheris 1 mm. longis, connectivo intra parum incrassato. *Ovarium* apice pilosum; stylus 0·75 mm. longus, glaber.

Pang Pui, 540 m., growing over limestone rocks, *Kerr* 3175.

Cissus dissecta *Craib* [Ampelidaceae]; a *C. Craibii* Gagnep. indumento partium omnium breviore, foliorum lobis angustioribus recedit.

Caules e radice perenni annui, erecti, graciles, 19–40 cm. alti, vel (ex *Marcan*) etiam volubiles, iuventute densius crassius crispatim puberuli, demum glabri, sulcati. *Folia* palmatim 5–7-lobata, ad 10 cm. longa et 12 cm. lata, membranacea vel chartaceo-membranacea, subtus pallidiora, supra setulis brevibus albis sparsis sed margines versus magis numerosis instructa, subtus ad nervos setulosa, margine setuloso-ciliata, lobis lanceolatis oblanceolatis vel linearibus usque ad 8·5 cm. longis et 3 cm. latis angustioribus dentatis vel lobulatis latioribus pinnatim lobulatis, lobulis integris vel plus minusve serratis, costis supra conspicuis subtus prominulis, nervis lateralibus utrinque circa 5 subtus conspicuis, petiolo 1·5–4·8 cm. longo subtus striato indumento ei caulis simili tecto suffulta; stipulae 3 mm. longae, brunneae, medio fusco-umbonatae, puberulae. *Cymae* oppositifoliae, pedunculo communi 1–2·8 cm. longo suffultae, 1–3 cm. diametro, pedunculis partialibus 7–9 mm. longis, pedicellis 2–3 mm. longis, et pedunculis et pedicellis puberulis; flores lutei (ex *Marcan*). *Calyx* circa 0·5 mm. longus, 4-lobulatus, dorso puberulus. *Petala* 4, sub anthesin libera, vix 2 mm. longa, 1 mm. lata, dorso papillosa, medio apicem versus pauci-setulosa. *Antherae* circa 0·5 mm. longae, connectivo facie interiore gibboso; filamenta 1 mm. longa. *Discus* crenulatus. *Ovarium* glabrum.

Ratburi, under 50 m., deciduous forest, *Kerr* 9008 (*type*). Kanburi, 70 m., open jungle on rocky hillside, *Marcan* 932.

Cissus Marcanii *Craib* [Ampelidaceae]; a *C. vitiginea* Planchon foliorum lobis longioribus angustioribus inter alia distinguenda.

Ramuli herbacei, primo densius hirsuti, mox sparse hirsuti, striati, sicco substraminei. *Folia* ovata vel ambitu rotundata vel subquadrata, apice angustata, summo apice mucronata, basi cordata, cordato-truncata vel subtruncata, saepissime conspicue sed haud alte 3-lobata, rarissime haud lobata, 6·5–9 cm. longa, 5–8 cm. lata, chartacea, sicco viridia, pagina superiore ad costam nervosque sparse hirsuta, aliter pilis brevioribus albis sparse instructa, inferiore ad costam nervos nervulosque similiter sed paulo longius hirsuta, e basi 3–5-nervia, nervis secondariis (e

costa ortis) utrinque 4–5, omnibus supra pallidis conspicuis subtus prominulis ad marginem currentibus, nervis transversis inter se parallelis subtus conspicuis, margine mucronato-denticulata, petiolo 3–6 cm. longo indumento ei ramulorum simili tecto suffulta; stipulae oblongae, 2·5 mm. longae; cirrhi apice furcati. *Cymae* oppositifoliae, saepissime ramulis brevibus lateralibus foliis reductis gestae, ad 2 cm. (pedunculo communi ad 1·5 cm. longo excluso) longae et vix 2 cm. diametro, pedunculis partialibus circa 5 mm. longis, omnibus indumento ei ramulorum simili instructis; pedicelli graciles, circa 2 mm. longi, basi articulati, breviter sparse pubescentes; bracteae parvae; alabastra pyramidalia, obtusa, breviter sparse pubescentia; flores lutei (ex *Marcan*). *Calyx* vix 1 mm. longus, viridis, extra parce pubescens, lobis 4 brevibus rotundatis vel deltoideo-rotundatis. *Petala* 4, oblongo-deltoidea, apice cucullata, 1·75 mm. longa, 1·25 mm. lata, dorso parce pubescentia. *Filamenta* 1 mm. longa, glabra; antherae 0·5 mm. longae, paulo longiores quam latiores, connectivo facie interiore incrassato. *Discus* crenulatus, ovarium paululo superans. *Stylus* staminibus brevior.

Kanburi, 40 m., open jungle, *Marcan* 882.

Leea dentata *Craib* [Leeaceae]; species foliis simpliciter pinnatis, foliolis maiusculis grossius dentatis, acumine dentibus haud longiore, floribus rubro-purpureis distincta.

Frutex ad 3 m. altus (ex *Kerr*); ramuli iuventute puberuli vel breviter sparse pilosuli, striati, sicco sub-brunnei, circa 8 mm. diametro. *Folia* pinnata vel in exemplo unico apud inflorescentiam unifoliolata, ad 42 cm. (petiolo 10–12·5 cm. longo incluso) longa, petiolo supra basi concavo superne terete vel supra canaliculato, rhachi supra plus minusve latius canaliculato, ambobus striatis; foliola 7, rarius solitaria, oblonga, oblongo-elliptica vel oblongo-obovata, basi cuneato-rotundata vel cuneata, apice acumine dentibus aequilongo instructa, 12–19 cm. longa, 5·5–12 cm. lata, rigide chartacea, sicco supra fusco-brunnea, subtus brunnea, nervis lateralibus basem versus pagina superiore puberulae costa pagina inferiore apud nervorum lateralium bases puberula, aliter glabra, nervis lateralibus utrinque 10–12 rectis supr, prominulis subtus prominentibus, nervis transversis inter sa parallelis pagina superiore conspicuis inferiore prominulis, margine grossius irregulariter dentata vel inferne interdum etiam lobulata. nervis lateralibus in dentes excurrentibus, petiolulo valido 5–10 mm, longo supra canaliculato suffulta, terminali usque ad 2·5 cm. a lateralibus distante; stipulae deciduae, cicatrice circa 3·5 cm. longa. *Inflorescentia* subcorymbosa, 10–12 cm. diametro, 4–6 cm. (pedunculo communi ad 8 cm. longo excluso) longa, ramis oppositis vel rarius subverticillatis inferioribus patulis vel oblique erectis superioribus oblique erectis; flores rubro-purpurei (ex *Kerr*), subsessiles. *Calyx* cum receptaculo circa 2·5 mm. longus, lobis brevibus apice obtusiusculis. *Petala* 5, superne incrassata, apice

cucullata, 2·5 mm. longa, 1·5 mm. lata. *Coronae* lobi oblongi, apice emarginati, 1·5 mm. longi. *Antherae* 1·25 mm. longae, connectivo lato rubro. *Stylus* 2·75 mm. longus.

Chiengmai, 300 m., scrub jungle, *Kerr* 3294.

Leea expansa *Craib* [Leeaceae]; ab affini *L. umbraculifera* C.B. Clarke foliolis maioribus facile distinguenda.

Frutex caule simplice circa 3 m. alto (ex *Kerr*) iuventute pruinoso lenticellis mox subconspicuis. *Folia* bi- vel tri-pinnata, circa 60 cm. (petiolo circa 20 cm. longo incluso) longa; pinnae 1–2-iugae, 3–5-foliolatae, inferiore interdum iterum pinnata 3-foliolata; foliola lanceolata, oblongo-lanceolata, rarius subovata vel elliptica, apice longius acuminata, summo apice mucronulata, basi cuneata vel late cuneata, 5·5–21 cm. longa, 2·3–6·5 cm. lata, chartacea vel rigide chartacea, sicco plus minusve brunnescentia, subtus pallidiora, glabra, nervis lateralibus utrinque 6–12 arcuatis intra marginem anastomosantibus pagina utraque gracilibus prominulis, nervis transversis inter se parallelis obliquis pagina utraque subprominulis, margine subregulariter serrata, petiolulo 5–18 mm. longo supra canaliculato sicco pluri-sulcato suffulta, terminali a lateralibus 3–4·5 cm. distante; stipulae deciduae, cicatrice circa 2 cm. longa. *Inflorescentia* corymbosa, pedunculo communi 5 cm. longo incluso circa 18 cm. longa, 30 cm. diametro, pedunculis partialibus 2 oppositis 4·5–11 cm. longis iterum ramosis cum pedunculo communi sicco plus minusve angulatis vel sulcatis; flores puniceo-albi (ex *Kerr*), breviter pedicellati. *Calyx* cum receptaculo 2 mm. longus, glaber, lobis brevibus apice rotundatis glandula notatis. *Petala* 5, lanceolata, apice cucullata, 3 mm. longa, fere 2 mm. lata. *Coronae* lobi oblongi, 2·5 mm. longi, 0·75 mm. lati, apice rotundati, subintegri vel parum retusi, superne medio interne incrassati. *Antherae* 1·5 mm. longae, connectivo lato rubro. *Stylus* 1·5 mm. longus.

Kaw Chang, 100 m., evergreen forest, *Kerr* 9236.

Leea Schomburgkii *Craib* [Leeaceae]; a *L. sambucina* Willd. foliolis grosse serratis vel dentatis, nervis lateralibus in dentes excurrentibus, floribus rubris recedit.

Caulis (vel *ramulus* ?) glaber, iuventute substramineus vel subfuscus, striatus vel substriatus, ad 8 mm. diametro. *Folia* pinnata vel bipinnata vel apud inflorescentiam unifoliolata, petiolo 8–12 cm. longo incluso ad 44 cm. longa, rhachi saltem superne supra canaliculato, glabra; folia pinnata 7-foliolata; folia bipinnata, pinnis uni-iugis 5–7-foliolatis 19–30 cm. (petiolo 1–2·5 cm. longo incluso) longis; foliola saepissime oblonga, apice acuminata, basi late cuneata vel rotundata, 8–21 cm. longa, 2–6·5 cm. lata, rigide chartacea vel subcoriacea, sicco brunnea, subtus parum pallidiora, costa pagina utraque sicco prominente superiore subacuta inferiore subalata, nervis lateralibus utrinque 8–12 supra gracilibus subprominulis subtus prominulis vel prominentibus sicco saepe

angulatis rectis vel subrectis in dentes excurrentibus, nervulis inter se parallelis transversis supra conspicuis vel subprominulis subtus prominulis, margine grossius crenato-serrata vel dentata, interdum inferne lobulata, petiolulo 1–7 mm. longo suffulta, terminali a lateralibus ad 2·5 cm. distante. *Corymbi* et terminales et axillares, 10·5–15 cm. (pedunculo communi 7–11 cm. longo incluso) longi, 9–15 cm. diametro, ramulis saepissime oblique adscendentibus 3–6·5 cm. longis cum pedunculis sicco sulcatis plus minusve puberulis; flores subsessiles, sicco corallini. *Calyx* cum receptaculo circa 3 mm. longus, lobis apice rotundatis. *Petala* 5, oblonga, apice incrassata, cucullata, 3–3·5 mm. longa, 1·5–1·75 mm. lata. *Corona* 1·5 mm. alta, lobis quadrato-oblongis apice parum recurvis emarginulatis.

Anghin, *Schomburgk* 256 (*type*). Sriracha, 30 m., *Mrs. D. J. Collins* 427.

Leea tenuifolia *Craib* [Leeaceae]; a *L. Mastersii* C. B. Clarke cui maxime affinis inflorescentia dense aequaliter puberula recedit.

Caules ad 1 m. alti (ex *Kerr*), sulcati, glabri. *Folia* bipinnata (an semper ?), circa 50 cm. (petiolo 12 cm. longo incluso) longa, petiolo cum rhachi sulcato; pinnae uni-iugae, 24 cm. longae, 5-foliolatae, terminali 3-foliolata a lateralibus circa 10 cm. distante; foliola oblonga, ovata vel elliptica, ad 20 cm. longa et 12 cm. lata, basi lateralia rotundata vel truncata, saepe inaequilateralia et cordatula, membranacea, sicco viridia, subtus pallidiora, supra ad costam nervosque laterales, aliter mox sparse, setosa, subtus ad costam nervos nervulosque similiter setosa, nervis lateralibus utrinque 11–14 supra conspicuis subtus prominentibus ad marginem currentibus, nervis transversis inter se parallelis sat numerosis subtus prominulis, margine irregulariter serrato-crenata, petiolulo ad 2 cm. longo suffulta, terminali a lateralibus 4·5–6 cm. distante; stipulae deciduae. *Corymbi* pedunculo communi 15 cm. longo suffulti, ad 14 cm. diametro, partiales 5·5 cm. diametro pedunculo 5 cm. longo suffulti, pedunculis sulcatis ferrugineo-pubescentibus vel partialibus superne rubescentibus; pedunculi ultimi et pedicelli rubri, densius puberuli; flores rubri, pedicellis brevibus basi articulatis suffulti. *Calyx* vix 2 mm. longus, extra papilloso-puberulus vel subglaber, lobis 5 deltoideis subacutis 0·75 mm. longis. *Petala* 5, apice incrassata, parum concava, apiculata, dorso parce glandulosa. *Disci* lobi anguste oblongi, apice retusi vel subtruncati, intra medio apice parum carinati. *Ovarium* glabrum, lobulatum, stylo pallido 0·75 mm. longo.

Korat, Chan Tûk, Kao Sisiat'A, 300 m., bamboo forest on limestone hill, *Kerr* 9114.

Allophylus betongensis *Craib* [Sapindaceae-Sapindeae]; ab *A. chartacea* Radlk. petiolo breviore, foliis subintegris recedit.

Frutex c. 50 cm. altus (ex *Kerr*); ramuli primo puberuli, mox glabri, cortice cinereo vel brunneo-cinereo obtecti. *Folia* uni-

foliolata, rarissime 3-foliolata, petiolo 10–25 mm. longo puberulo supra late haud alte canaliculato apice stipellis duabus deciduis instructo suffulta; foliola oblongo-oblanceolata, apice acuminata, basi saepe inaequilateralia, rotundata vel cuneata, usque ad 27·5 cm. longa et 10·5 cm. lata, chartacea, subtus pallidiora, matura glabra vel subtus ad costam puberula, nervis lateralibus utrinque 10–12 cum costa supra prominulis subtus prominentibus, nervulis supra plus minusve conspicuis subtus prominulis, margine apicem versus pauci-denticulata. *Inflorescentia* axillaris, racemiformis, 5–8·5 cm. longa, pedunculo communi 5–10 mm. longo cum rhachi pluri-sulcato puberulo suffulta; pedicelli 1·5 mm. longi, puberuli; alabastra depresso-globosa, puberula. *Sepala* 4, inter se inaequalia, exteriora minora, concava, elliptica, interiora maiora, plana, subrotundata, 1·5–2 mm. longa, 1·25–1·75 mm. lata, extra puberula, intra glabra, ciliolata. *Petala* cuneata, 1·75 mm. longa, 1·25 mm. lata, apice parum retusa, squamis pilosis instructa, margine inferne piloso-ciliata. *Disci* lobi extra glabri, intra irregulariter sparse puberuli. *Stamina* 8, antheris 0·5 mm. longis, filamentis 1·75 mm. longis pilosis.

Pattani, Betong, 400 m., evergreen forest, *Kerr* 7665.

Otophora siamensis *Craib* [Sapindaceae-Sapindeae]; ab affini *O. furcata* Pierre petiolis pedicellisque multo brevioribus facile distinguenda.

Frutex vel *arbor* 3–4-metralis (ex *Kerr* et *Marcan*); ramuli sparse breviter pubescentes vel puberuli, pallide brunneo-corticati. *Folia* pinnata, 56–67 cm. (petiolo communi 10·5–18 cm. longo incluso) longa, petiolo subterete, rhachi superne angulato vel subalato, ambobus striatis et puberulis; stipulae obliquae, ovatae vel subellipticae, obtusae vel breviter obtuse acuminatae, ad 3 cm. longae et 2 cm. latae, saepe divisae, inferne puberulae, sessiles; foliola 19–23, alterna vel subopposita, lanceolata vel anguste lanceolato-oblonga, apice acuminata vel subacuminata, basi inaequilateralia, latere altero angustata vel saepius acuminata, altero rotundata vel truncata, 5·5–22·5 cm. longa, 2–5 cm. lata, chartacea, sicco plus minusve fusca, subtus pallidiora, glabra, nervis lateralibus utrinque ad 18 bene intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervulis rete supra saepe conspicuum subtus prominulum efficientibus, integra, sessilia vel petiolulo crasso circa 1 mm. longo suffulta. *Panicula* infra folia orta, circa 52 cm. (pedunculo communi 5 cm. longo incluso) longa, ramis inferioribus ad 40 cm. longis, iuventute puberula, mox omnino glabra; flores rubri (ex *Kerr*), e ramulis ultimis 1–2 mm. longis orti, pedicellis 4 mm. longis glabris suffulti. *Sepala* 4, oblongo-elliptica vel obovata, ad 4 mm. longa et 3 mm. lata, ciliolata. *Petala* oblonga vel subquadrato-oblonga, 2·5–3 mm. longa, 2–2·5 mm. lata, basi latere utroque auriculata, extra basi pilis paucis instructa, praesertim inferne ciliata. *Antherae* 2 mm. longae, filamentis brevibus. *Fructus* plus minusve globosus,

saepe compressus, ad 1·2 cm. diametro, pedicello ad 7 mm. longo suffultus.

Krat, Kao Saming, under 20 m., evergreen forest, *Kerr* 9401 (*type*). Kaw Chang, 2 m., stream bank, *Marcan* 1271.

Turpinia robusta *Craib* [Staphyleaceae]; species a *T. trifoliata* Ridl. partibus omnibus magis robusta, floribus magis globosis distinguenda.

Arbor circa 8 m. alta (ex *Kerr*); ramuli glabri, mox teretes, substriati, cortice rubro-brunneo obtecti, lenticellis haud conspicuis. *Folia* opposita, suprema patula, trifoliolata vel in folio unico 4-foliolata, petiolo 2–4·5 cm. longo supra anguste canaliculato vel parte mediana terete glabro suffulta; foliola oblonga, oblongo-elliptica vel oblongo-obovata, apice acuminata, basi cuneata vel subacuminata, usque ad 13 cm. longa et 6 cm. lata, coriacea vel chartaceo-coriacea, subtus pallidiora, glabra, nervis lateralibus utrinque circa 10 late arcuatis intra marginem anastomosantibus supra conspicuis vel subprominulis subtus prominulis, reticulatione supra conspicua vel subobscura subtus plus minusve conspicua, margine denticulato-serrata vel crenato-serrata, petiolulo 3–10 mm. longo supra canaliculato apice biglanduloso suffulta, terminali a lateralibus 8–25 mm. distante. *Paniculae* ex axillis superioribus ortae, pedunculo communi incluso 8–15 cm. longae, 7–11 cm. diametro; pedunculus communis 0·7–4 cm. longus, apice bracteis duabus latis circa 2·5 mm. longis deciduis instructus, glaber; pedunculi ultimi et pedicelli puberuli; pedicelli 1–1·75 mm. longi. *Sepala* 5, subelliptica vel elliptico-obovata, apice rotundata, circa 1·75 mm. longa et 1·5 mm. lata, ciliolata. *Petala* 5, obovata, apice rotundata, 2 mm. longa, 1·5 mm. lata, ciliolata. *Stamina* 5, glabra, filamentis 1·5 mm. longis inferne ampliatis complanatis apice tenuibus; antherae circa 0·75 mm. longae. *Discus* brevis, apice plus minusve denticulatus. *Ovarium* disco subaequialtum, stylis brevibus; stigmata 3, apice subplana, inter se cohaerentia.

Mûang Fang, Doi Pahom Pok, 1400–1600 m., common in evergreen forest, *Kerr* 5178.

Rhus fulva *Craib* [Anacardiaceae-Anacardieae]; species foliolis 6-iugis subtus dense fulvo-tomentosis distinguenda.

Arbor c. 10 m. alta (ex *Kerr*); ramuli crassi, primo ferrugineo-tomentosi, crasse angulati, ad 1 cm. diametro. *Folia* pinnata, petiolo 17 cm. longo incluso circa 70 cm. longa, et petiolo et rhachi tenuiter ferrugineo-pilosulis, petiolo supra inferne plano, rhachi supra plus minusve canaliculato, ambobus striatis; foliola 6-iuga, opposita, oblonga, apice acuminata, acuta, basi parum inaequilateralia, rotundata vel truncata vel suprema late cuneata, ad 16 cm. longa et 5 cm. lata, chartacea, supra sicco viridia vel brunnescentia, ad costam breviter pubescentia, aliter iuventute puberula, matura puberula vel fere glabra, subtus dense fulvo-tomentosa sed ad costam plus minusve glabrescentia, nervis lateralibus utrinque

circa 25 supra mox parum impressis subtus conspicuis, nervulis rete gracile supra mox impressum subtus conspicuum efficientibus, integra vel obsolete denticulata, superiora sessilia, inferiora petiolulo 1–2 mm. longo suffulta, terminali a lateralibus 2·3 cm. distante. *Panicula* axillaris, pedunculo communi 12–20 cm. longo incluso 22–33 cm. longa, thyrsiformis, et pedunculo et rhachi primo dense fulvo-tomentosis mox plus minusve glabrescentibus, bracteis deciduis inferioribus linearibus ad 17 mm. longis, floribus densis sessilibus vel subsessilibus. *Sepala* 5, oblonga vel late ovata, 0·5 mm. longa, dorso parce pilosa vel subglabra. *Petala* oblonga, sepalis paululo longiora, glabra.

Doi Chiengdao, 1300 m., open evergreen forest, *Kerr* 5605. The collection is in very young bud.

Rhus rhetsoides *Craib* [Anacardiaceae-Anacardieae]; species ramulis crassis iuventute fuscis conspicue lenticellatis, foliis pinnatis glabris, foliolis integris petiolulatis distincta.

Arbor c. 10 m. alta (ex *Kerr*); ramuli novelli crassi, fusci, plus minusve glauci, angulati, saepissime conspicue et copiose lenticellati, parce pilosi, cito glabri, annotini cortice cinereo-brunneo obtecti, usque ad 1 cm. diametro. *Folia* pinnata, petiolo 9–13·5 cm. longo incluso 30–35 cm. longa, glabra, petiolo basi supra plano superne subterete vel supra subplano angulato vel subalato, rhachi terete sulcato vel supra canaliculato; foliola 4–5-iuga, opposita, oblongo-lanceolata, oblonga vel rarius ovata, apice longius acute acuminata, basi truncata, rotundata vel cuneata, saepe acuminata, ad 17 cm. longa, 4·5–6·5 cm. lata, chartacea vel chartaceo-coriacea, nervis lateralibus utrinque 15–20 supra conspicuis subtus plus minusve prominulis, nervulis laxis supra vix conspicuis subtus plus minusve conspicuis, integra, petiolulo circa 6 mm. longo supra conspicue canaliculato subalato suffulta. *Paniculae* ex axillis foliorum hornotinorum ortae, 15–18 cm. (pedunculo communi circa 4 cm. longo incluso) longae, glabrae; flores virides (ex *Kerr*); pedicelli 2·5 mm. longi. *Sepala* 5, oblongo-ovata, apice rotundata, 1 mm. longa, 0·75 mm. lata. *Petala* 5, elliptico-oblonga vel subelliptica, 2 mm. longa, 1·25 mm. lata, costa dorso conspicua. *Filamenta* glabra, vix 1 mm. longa, antheris oblongis vix 0·75 mm. longis. *Discus* brevis, margine undulatus. *Ovarium* stylo subaequilongum, 0·75 mm. altum, glabrum, uniloculare, stylis ad medium connatis; stigmata 3, brevia; ovulum solitarium, horizontale, funiculo basali.

Mûang Fang, Doi Pahom Pok, 1100 m., evergreen forest, *Kerr* 5169.

Gluta obovata *Craib* [Anacardiaceae-Anacardieae]; ab affini *G. tavoyana* Wall. ex Hook. f. inflorescentiae indumento crassiore inter alia recedit.

Arbor circa 10 m. alta (ex *Kerr*); ramuli iuventute angulati, densius molliter fulvo-tomentelli, mox cortice cinereo-brunneo

obtecti. *Folia* oblongo-obovata, oblanceolata vel obovata, apice obtusa, breviter obtuse acuminata, vel rotundata, interdum retusa, basi cuneata, 8–23 cm. longa, 3·7–11·2 cm. lata, subcoriacea, sicco plus minusve brunnescentia, subtus pallidiora, matura glabra, iuniora praesertim pagina inferiore basem versus puberula, nervis lateralibus utrinque 16–18 intra marginem anastomosantibus supra subprominulis subtus prominentibus, nervulis supra conspicuis subtus prominulis, margine integra, petiolo 1–2·5 cm. longo supra late canaliculato vel fere subalato indumento ei ramulorum simili tecto suffulta. *Paniculae* axillares, foliis saepius breviores vel ea interdum aequantes, densius fulvo-puberulae; pedicelli 1·5 mm. longi, puberuli. *Calyx* spathaceus, unilateraliter rumpens, apice haud lobatus vel saepissime 2-lobatus, 4·5 mm. longus, extra puberulus, intra glaber, ciliatus. *Petala* ad 6·5 mm. longa, basi ad 1·5 mm. ad axem floralem adnata, dorso inferne ad costam nervosque puberula, intra inferne, basi excepta, papillosa. *Stamina* 5, filamentis 3·5 mm. longis teretibus pallidis glabris. *Ovarium* glabrum, 1 mm. altum, ovulo solitario e summo funiculo basali suspenso.

Chiengmai, Mê Kang, 390–1230 m., deciduous and evergreen forest, *Winit* 1291 (*type*). Chawm Tawng, Mê Kang, 600 m., deciduous forest by stream, *Kerr* 5354.

XLII.—A NEW GENUS FROM UGANDA.—J. Hutchinson and J. E. Dandy.

A collection of plants made in Uganda by Mr. J. D. Snowden in 1924–5 contains an interesting specimen which proves to belong to a new genus of the *Polygonaceae*. This collection was gathered on Mount Elgon, and the habitat of the plant in question is described by Mr. Snowden as "undergrowth in the forest at an altitude of 1800–2100 metres."

The plant is a climbing herb, and is remarkable on account of its fruits. These are rather large, and for the purpose of their distribution by animals are provided with numerous barbed setae. In the flower these appendages are first observable as minute papillae, resembling beads, arranged in two rows along each angle of the trigonous ovary (fig. D, E). As the fruit matures the papillae grow out into long purple setae, each of which is armed at the tip with several backwards-directed barbs arranged in a radiate manner (fig. G). These barbed appendages are reminiscent of those of the fruits of *Torilis gracilis* Engl., *Harpagophytum*, and *Bidens*, and probably serve the same purpose. In *Bidens*, however, the grapples represent a modified pappus, whereas in the new genus they are of a different morphological nature, being emergences from the ovary-wall which do not correspond to any feature general in the rest of the *Polygonaceae*. Some members of the latter family possess "fruits" which at first sight

appear to resemble those of Snowden's plant. The resemblance, however, is only superficial, for in these cases (e.g. *Rumex nepalensis* Spreng., *R. Brownii* Campd., etc.) the setae are simply hooked, not radiately barbed, and adorn the margins of the persistent *calyx-lobes* which enclose the true fruit.

The new genus finds its closest affinities in the genera *Polygonum* and *Fagopyrum* of the tribe *Eupolygoneae*. It differs from both in the armed nature of the fruit, and from *Polygonum* also in the very broad cotyledons and in the nut being much exserted from the persistent calyx. In the last-mentioned two characters the plant agrees with *Fagopyrum*, which it still further resembles in the shape and venation of the leaves.

Harpagocarpus *Hutch. & Dandy*, genus novum inter genera *Eupolygonearum* ob fructus magnos e calyce longe exsertos, angulis setis numerosis longis apice stellato-hamatis armatos, valde distinctum.

Harpagocarpus Snowdenii *Hutch. & Dandy*, sp. nov.

Herba scandens; caules teretes sed leviter et crebre costati, glabri, internodiis usque ad 12 cm. longis. *Folia* sagittata, inferiora ovato-triangularia acute acuminata ad 8 cm. longa et 3 cm. lata, superiora angustiora lineari-lanceolata, integra, tenuiter chartacea, basi digitate 7–nervia, supra viridia glabra, infra pallidiora et tenuiter reticulata costa nervisque setosis exceptis glabra; petioli gracillimi, brunnescentes, 5 cm. attingentes; ochreae membranaceae, oblique truncatae, circiter 0·5 cm. longae, glabrae. *Flores* in racemis axillaribus terminalibusque gracilibus usque ad 15 cm. longis glabris dispositi; pedicelli 1–2-nati, ad 2 mm. longi, medio articulati, in fructu ab articulatione deflexi; bracteae ochreaeformes sed minores. *Sepala* 5, inaequalia, basi connata, obovata, apice rotundata, ad 3·5 mm. longa et 2·5 mm. lata, in fructu parum accrescentia et ad eum adpressa, viridia, margine angustissime hyalina. *Stamina* 8, fauce calycis tubi inserta; filamenta subulata, calycis lobis breviora; antherae suborbiculares. *Ovarium* trigonum, ambitu ovato-ellipticum, angulis globulis subcontiguis 2-seriatim dispositis ornatum; styli 3, filiformes, demum recurvati, stigmatibus subcapitatis. *Fructus* trigonus, nitidus, circiter 8 mm. longus, angulis setis numerosis purpureis 2 mm. longis apice stellato-hamatis hamis reflexis armatus. *Semina* trigona, ambitu ovata, acute acuminata, circiter 6 mm. longa, funiculo 2 mm. longo geniculato suffulta; cotyledones latissimae, reniformes.

Tropical Africa. Uganda: Mt. Elgon, Mt. Nkokonjeru, undergrowth in forest, 1800–2100 m., *Snowden* 946.

Harpagocarpus Snowdenii.

A, lower leaf. B, flower. C, stamen. D, ovary. E, angle of same, showing the two rows of papillae. F, fruit (× 6). G, seta from same. H, seed. I, embryo. J, same with cotyledons spread out.

XLIII.—NOTES ON AFRICAN GRASSES: II.*

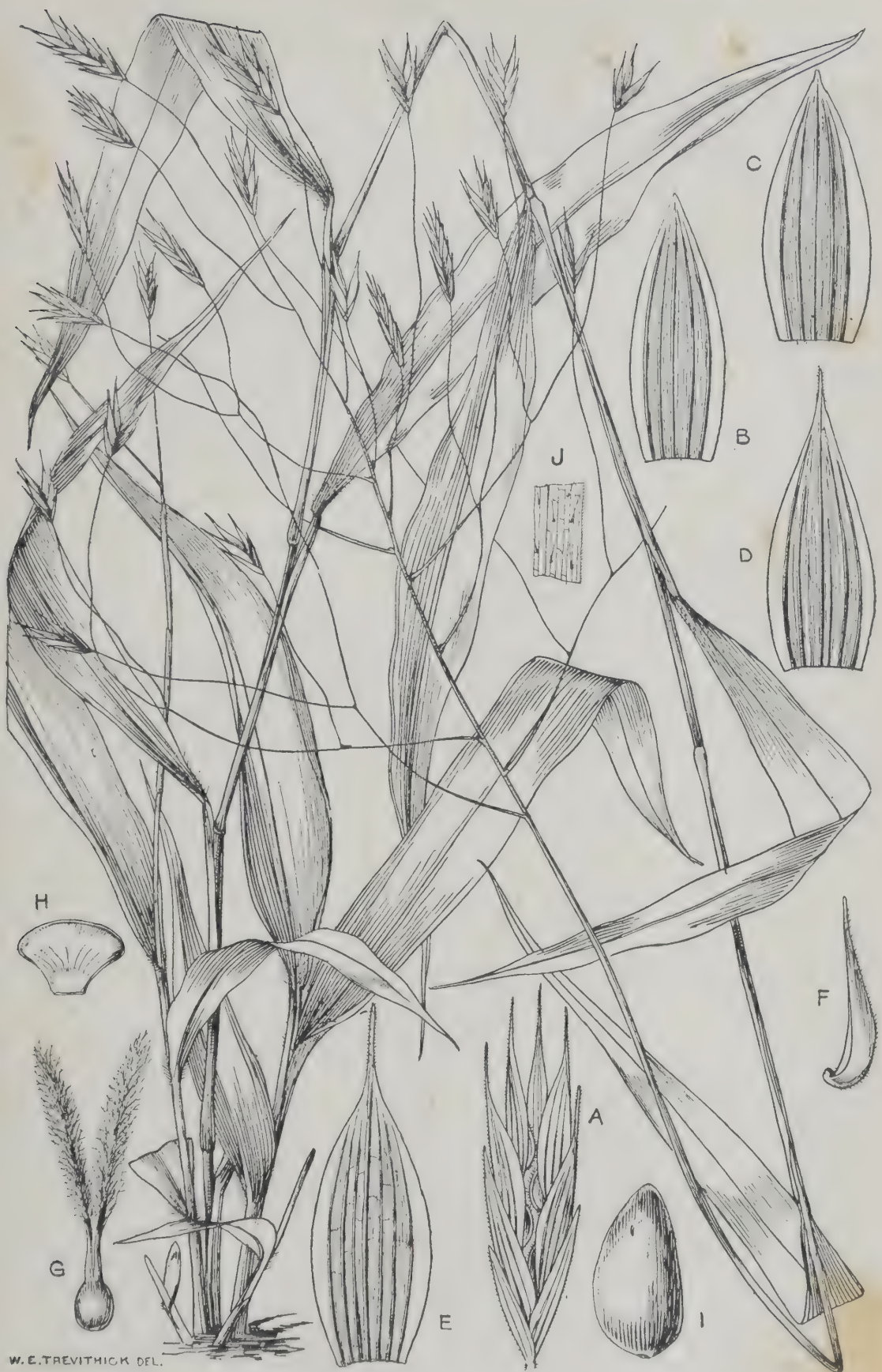
Bromuniola *Stapf et C. E. Hubbard.* Genus novum *Uniolae* Linn., affinis, sed spiculis aristulatis, glumis (3) et valvis 5–7-nervis, nervis aequaliter dispositis, differt. Panicula laxissima, diffuse paucispiculata.

Spiculae oblongae, lateraliter compressae, longe pedicellatae, paniculatae; rhachilla supra glumas et inter anthoecia disarticulata, internodiis longis inter anthoecia puberulis. *Anthoecia* 3–7, hermaphrodita vel summo imperfecto. *Glumae* 3, persistentes, subaequales, carinatae, carinis scaberulis, glabrae, herbaceae, marginibus hyalinis, prominenter nervosae, inter nervos transverse nervulosae; glumae I et II 5-nerviae, acutae vel mucronatae; gluma III 7-nervia, mucronata vel breviter aristata. *Valvae* glumis simillimae, 7-nerviae, acutae, breviter aristatae, carinatae, carinis scaberulis. *Valvulae* valvas paulo breviores, compressae, lineares, gibbosae, 2-carinatae, inter carinas breviter ciliatas concavae, apice obtusae. *Lodiculae* 2, late cuneatae, carnosae. *Stamina* 3. *Ovarium* ellipsoideum, glabrum; styli terminales, liberi, breves, glabri; stigmata plumosa, sub apice lateraliter exserta. *Caryopsis* lateraliter compressa, oblique ovoidea, valva valvulaque laxe inclusa, libera; embryo brevis; hilum punctiforme, basale.—Gramen *perenne*, foliorum laminis lanceolatis vel lanceolati-ovatis, inter venas transverse venulosis. *Panicula* ampla, late aperta, ramis et pedicellis longissimis gracillimis patentibus, spiculis paucis viridibus.

Species 1, angolensis.

B. Gossweileri *Stapf et C. E. Hubbard.* *Culmi* laxe caespitosi, erecti vel breviter ascendentes, ad 85 cm. longi, moderate validi, glabri, laeves, simplices, 5–7-nodi, nodis glabris. *Foliorum vaginae* solutae, striatae, firmae, glabrae, inferiores quam internodia longiores, internodiis superioribus longe exsertis. *Ligulae* brevissimae, truncatae, minute ciliatae, membranaceae. *Laminae* 14–18 cm. longae, 1–2 cm. latae, basi breviter attenuatae, acute acuminatae, planae, utrinque obscure pubescentes, pilis debilibus albis e tuberculis minutis ortis indutae, versus ligulam longe pilosae, marginibus scaberulis. *Panicula* ambitu orbiculata, valde laxe diffusa, 11–20 cm. longa, 14–25 cm. lata; rhachis angulata, gracilis, scaberula; rami solitariae, simplices vel 1–2-furcati, inferiores ad 16 cm. longi, ascendentes vel patentes, ut pedicelli flexuosi, tenues, angulati, scaberuli. *Spiculae* solitarii, 11–17 mm. longae, 4–5 mm. latae, laxe inbricatae. *Glumae* ex ovato-lanceolato ad ovatum vergentes, internodiis inter glumas ad 1 mm. longis; gluma I 6·5–7·5 mm. longa, gluma II 7–8 mm. longa, gluma III 9 mm. longa, arista ad 0·75 mm. longa. *Rhachilla* inter valvas internodiis ad 2·5 mm. longis. *Valvae* ovatae, 8·5–9·5 mm. longae, ex apice aristatae; aristae 2–3 mm. longae, scaberulae, tenues, rectae. Valvulae a latere visae oblique lanceolatae, 6–7 mm. longae, carinis breviter

* Continued from *Kew Bull.* 1926, p. 250.



Bromuniola Gossweileri *Stapf et C. E. Hubbard*, showing habit. A, spikelet (× 4). B, glume I (× 4). C, glume II (× 4). D, glume III (× 4). E, valve (× 4). F, valvule (× 4). G, pistil (× 5). H, lodicule (× 12). I, grain (× 10). J, portion of leaf-blade.

ciliatis et viridibus, marginibus hyalinis. *Lodiculae* albidae, 1 mm. latae. *Antherae* lineares, 2 mm. longae. *Caryopsis* 3 mm. longa, nitida, rubro-brunnea.

Tropical Africa.—Angola: north of Malange, between Lukala, Gola and Luije rivers, 1200 m., in shady humid forests, June 1925, *Gossweiler* 8933.

Superficially *Bromuniola* resembles certain species of *Bromus*, e.g. *B. ramosus* Huds., but the number of glumes (3) and the glabrous ovary with its truly terminal style distinguish it readily. In the number of the glumes it approaches *Uniola* among the *Eufestuceae*, and in its general habit especially *U. latifolia* Michx., which, however has very much compressed spikelets with more numerous nerves and egibbous valvules. In habit our grass also recalls some of the Centotheceae, but it differs from these in the presence of a third glume and in the awned valves.

XLIV.—MISCELLANEOUS NOTES.

The following appointments have been made by the Secretary of State for the Colonies:—Mr. D. L. Blunt, M.A., Senior Agricultural Officer, Kenya; Mr. R. B. Jagoe, B.Sc., Agricultural Field Officer, Federated Malay States; Mr. W. L. Munn, Coffee Officer, Uganda; Mr. C. G. Hansford, Government Microbiologist, Jamaica, to be Mycologist, Uganda; Mr. W. Nowell, D.I.C., Assistant Director of Agriculture, Trinidad, to be Director of Agriculture, British Guiana (*K.B.* 1913, p. 359; 1920, p. 218.).

Lt.-Col. Sir John Ross of Bladensburg, K.C.B., K.C.V.O.—Prior to his lamented death on July 10th last Sir John Ross had been a correspondent of Kew for many years and the establishment is indebted to him for many valued contributions to our collections. One of the latest was the beautiful *Clethra Delavayi*. His garden at Rostrevor, Co. Down, is situated on the Carlingford Lough in the neighbourhood of the Mourne Mountains and, in addition to its natural beauty, is one of the most favoured spots in the British Isles for the cultivation of tender plants. Sir John was an enthusiastic collector of rare and beautiful trees and shrubs and this, together with his cultural skill, made his garden one of the most interesting in the Kingdom. He was one of the few persons, perhaps the only one in our islands, who successfully cultivated the "Beach heather" *Hudsonia ericoides*, a dwarf shrub related to the cistuses found in maritime situations on the eastern shores of North America.

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ROYAL BOTANIC GARDENS, KEW

XLV.—EXHIBIT OF HISTORICAL PICTURES OF KEW.

For many years a collection of pictures and plans relating to the Royal Village of Kew, and to the early history of the Gardens during the latter part of the eighteenth century, have been exhibited amongst the botanical pictures in Museum III at Kew.

These pictures relate to the period when H.M. Queen Caroline, H.R.H. the Princess of Wales (Augusta of Saxe-Gotha) and the Earl of Bute, H.M. King George III and Sir Joseph Banks took so great an interest in the Royal Gardens and when Sir William Chambers was engaged to design several of the buildings.

It has long been felt that this interesting historical collection should be more adequately displayed, and on learning that some alteration was contemplated in the arrangement of the pictures in Kew Palace permission was sought for their exhibition in the building around which so much of the early history of Kew and the Gardens has centred.

The following letters show that H.M. The Queen has been pleased to convey the King's gracious permission for the pictures to be displayed in the Palace and they have now been hung in the King's Antechamber and in the King's Bedroom :—

"*4th March*, 1925. "Royal Botanic Gardens, Kew.

"Dear Sir Derek Keppel,

"I venture to write to you on the subject of Kew Palace in connection with a letter I have received through the Ministry of Agriculture and Fisheries from H.M. Office of Works. I do so because I believe Her Majesty's recent visit to Kew, when you attended Her Majesty, was in connection with the proposed re-arrangement of pictures at Kew Palace with which the Office of Works' letter deals.

"We have collected together in Museum No. III at Kew a large number of interesting pictures relating to the history of the Royal Botanic Gardens and the Village of Kew. These are not easily seen by the public as there is not sufficient room for their proper display. It has long occurred to me that one of the rooms in Kew Palace would be an excellent place for the display of all the old pictures to which I have referred.

(712) Wt. 55—7. 3, 3 & 2. 10/26. Wy. & S., Ltd. Gp. 50 (4).

"Now that a re-arrangement of the pictures in Kew Palace is under contemplation I venture to ask you whether you think I might approach Her Majesty and put forward the suggestion that space might be found in the Palace for the historic collection of pictures now in our Museum.

"I am, etc.,

"(Sgd.) ARTHUR W. HILL.

"Hon. Sir Derek Keppel, G.C.V.O., C.M.G., C.I.E.,
"Ambassadors' Court,
"St. James's Palace,
"S.W.1."

"*7th March*, 1925. "Buckingham Palace.

"Dear Mr. Hill,

"I beg to thank you for your letter of the 4th instant.

"I had the honour to submit to The Queen your request that your pictures relating to the history of the Royal Botanic Gardens and the Village of Kew might be placed in Kew Palace.

"I am commanded to say that there would be no objection to this from Her Majesty's point of view, provided that the necessary space is available for them.

"I am further to ask you to get into communication with Mr. Lionel Cust to whom I will also write. Mr. Cust will be able to say what can be done to further your idea as soon as he has completed the re-arrangement of pictures already there.

"I am, etc.,

"(Sgd.) DEREK KEPPEL,

"Master of the Household."

"*9th March*, 1925. "Royal Botanic Gardens, Kew.

"Dear Sir Derek Keppel,

"Please accept my best thanks for your letter of March 7th. I am very pleased to hear that Her Majesty The Queen has no objection to the pictures relating to the history of the Royal Botanic Gardens and the Village of Kew being placed in Kew Palace should there be the necessary space available for them.

"I have written to Mr. Lionel Cust asking him whether he will be able to meet me and see the pictures and discuss the question of their accommodation in Kew Palace.

"I am, etc.,

"(Sgd.) ARTHUR W. HILL."

"*7th December*, 1925.

"Lord Chamberlain's Office, St. James's Palace.

"Dear Sir,

"The Lord Chamberlain understands that you have been in communication with Mr. Lionel Cust as to the possibility of exhibiting in Kew Palace some of the interesting old prints of Kew Palace and its vicinity, which are at present in the Botanical Museum, and that you have come to the following agreement with him, which I am desired to confirm:—

"1. The private drawings, etc., to be transferred are to relate only to the Palace and early history of Kew Gardens, mainly in the 18th century, and not in any way to the botanical use of the Gardens or any places or buildings connected with the scientific work.

"2. The selection to be made by the Director and his Museum Assistant with his (Mr. Cust's) approval, if considered necessary.

"3. The selection thus made to be delivered ready framed as a collection en bloc, to be handed over by due agreement to the custody of the Lord Chamberlain. A list to be kept by each party to the transaction.

"His Lordship is visiting Kew Palace about 12 p.m. on Monday next, the 14th, and would like, if possible, to see these pictures in the room where they are to be exhibited. I am to ask if it would be possible to arrange this, and if you could meet His Lordship at the Palace at this hour and date.

"Yours faithfully,

"(Sgd.) G. CRICHTON, COL.,

"Comptroller."

"*8th December*, 1925. "Royal Botanic Gardens, Kew.

"Dear Sir,

"I have to acknowledge receipt of your letter of December 7th with reference to the exhibition in Kew Palace of some of the interesting old prints of the Palace and the Village of Kew, which are the property of the Royal Botanic Gardens, Kew, and are now in our Museum No. III.

"I have had the pleasure of having received two visits from Mr. Lionel Cust and we arranged as to the pictures that might be exhibited and the rooms in which they should be placed. No further action, however, has been taken in the matter, as I have been waiting to receive the sanction of the Lord Chamberlain for the proposed exhibition. I am very glad to receive your letter of December 7th which gives me the necessary authority to proceed in the matter.

"1. The drawings which are to be transferred relate, as stated in paragraph 1 of your letter, to Kew Palace and the

early history of The Royal Gardens and the Village of Kew. No pictures of a botanical character or of our recent buildings will be included in the collection.

"2. The selection has already been made by myself and by Mr. Cust, and I had merely been waiting for the official sanction of the Lord Chamberlain.

"3. The selection of pictures will be framed and I shall be prepared to hand them over to the custody of the Lord Chamberlain on the understanding, of course, that the pictures belong to the Royal Botanic Gardens, Kew, and are a loan to the Lord Chamberlain's Department. A list of the pictures will be handed to the Lord Chamberlain and a list will be kept in my own custody.

"I regret that it will not be possible to show His Lordship the pictures in the rooms where they are to be exhibited when he proposes to visit Kew Palace on Monday next, December 14th. I shall, however, be pleased to show him some of the pictures which have been selected in the Museum adjoining the Palace, and I will attend at Kew Palace at 12 o'clock on Monday next in order to meet His Lordship.

"Yours faithfully,

"(Sgd.) ARTHUR W. HILL.

"Col. The Hon. George Crichton, K.C.V.O.,
"The Comptroller,
"Lord Chamberlain's Office,
"St. James's Park, S.W.1."

The following is a list of the pictures and plans which are the property of the Royal Botanic Gardens, and are on loan to the Lord Chamberlain's Department.

The interest of the collection has been enhanced by the inclusion from the Palace Collection of an engraving of H.R.H. Augusta, Princess of Wales, who conceived the idea of laying out a Botanic Garden near the Palace in 1759-60 when the Earl of Bute acted as her botanical adviser.

List of pictures on loan to the Lord Chamberlain's Department, selected and hung by Mr. Lionel Cust, May, 1926.

1. Temple of Victory.
2. The Great Pagoda.
3. Kew Palace and Outbuildings. H.M.O.W. 1880.
4. A View of Richmond Palace fronting the River Thames, as built by King Henry VII. 1765.

5-6. Kew Palace.

7. A View of the Lake and Island seen from the Lawn, with the Bridge, the Temples of Arethusa, and Victory, and the Great Pagoda in the Royal Botanic Gardens, Kew.
8. A View of the Lawn from the Palace with the Pagoda, the Temple of Victory and the Colonnade.
9. A View of the Wilderness with the Alhambra, the Pagoda, and the Mosque.
10. A View of the Palace from the South side of the Lake, with the Temples of Bellona and Aeolus, and the House of Confucius.
11. View of the Aviary and Parterre.
12. A Prospect of the Royal House at Richmond.
13. View of the Menagerie, and its Pavilion.
14. View of the Palace from the North side of the Lake, the Green House, and the Temple of Arethusa.
15. View of the Lake and Island, with the Orangerie, the Temples of Aeolus and Bellona, and the House of Confucius.
16. A View of the Palace from a Hill in the middle of the Lawn with the Bridge, the Temples of Bellona, of Pan, of Aeolus, and the House of Confucius.
17. A View of Alhambra and Pagoda.
18. A Plan of the House, Gardens, Park, and Hermitage of Their Majesties, at Richmond ; and of Their R.H. the Prince of Wales and the Princess Royal at Kew, 1734.
19. View of the Palace at Kew, from the Lawn.
20. } View of Sion House and the parts adjacent, taken from
21. } the Road next the Royal Gardens, Richmond, 1750.
22. An exact Plan of the Royal Palace Gardens and the Park at Richmond with Sion House, etc., 1754.
23. The Observatory in Richmond Gardens.
24. View of the Old Palace at Kew.
25. View of the Prince's House at Kew.
26. North Prospect of the Ruin in the Gardens at Kew.
27. A New Plan of Richmond Garden, 1748.
28. View of Sion House, looking towards Kew, 1753.
29. View of the South Side of the Ruins at Kew.
30. Kew Green, 1785:
31. The King's Palace at Kew.
32. The Palace of H.M. George the Third, 1806.
33. The Old Palace, Kew.
34. A View of Kew.
35. } Kew Chapel.
36. }

37. Design for a Stone Bridge erected across the River Thames from Brentford in Middlesex to Kew in Surrey. First stone laid 4th June 1783. Opened for carriages 22nd September 1789.
38. New Palace, Kew, 1823.
39. At Kew. 1823.
40. Kew Bridge from Strand on the Green.
41. Kew Bridge from Strand on the Green, 1832.
42. Kew Bridge from the Ferry at Brentford.
43. Kew Bridge.
44. Merlin's Cave in the Royal Garden, Richmond.
45. Section of Merlin's Cave. 1736.
46. Old Kew Bridge. W. Lewis Turner, 1903.
47. View of the Hermitage in the Royal Gardens, Richmond, 1736.
48. View of Lord Bute's Erections at Kew, with some part of Kew Green, and Garden. 1765.
49. The House of Confucius in Kew Gardens. 1773.
50. The Mosque in Kew Gardens. 1772.
51. A View of the Pavilion in Kew Gardens.
52. The East View of Kew and Strand Green.
53. The Royal Palace at Richmond in Surrey.
54. The South Prospect of His Majesties House at Richmond.
55. The North Prospect of His Majesties House at Richmond.
56. View of the Town and Bridge of Kew.
57. A View of the New Bridge over the Thames, from Kew in Surrey to Brentford in Middlesex.

XLVI.—AMORPHOPHALLUS TITANUM.

An event of more than usual interest during the past summer has been the flowering of a fine specimen of *Amorphophallus Titanum* Beccari, the giant aroid of Sumatra.

During its period of growth this plant consists of a tuber and a single leaf, the leaf being renewed biennially until the flowering stage is reached. The tuber has been known to attain a circumference of 6½ feet, the blade of the leaf a circumference of 45 feet and the whole plant a height of 17 feet.

The tuber of the present plant was very kindly presented to Kew in 1924 by Mr. E. Jacobson, of Fort de Kock, Sumatra. During the summer of 1925 it sent up a leaf to a height of about 11 feet, the circumference of the blade being about 18 feet. In 1926 the plant commenced to grow in the second week of May. From July 23rd daily measurements were made of the height of the developing flower. On this date the height was 2 feet 11½ inches. For the next week growth was very rapid, from three to four inches a day. The rate of growth then diminished, the height on August

PLATE X.

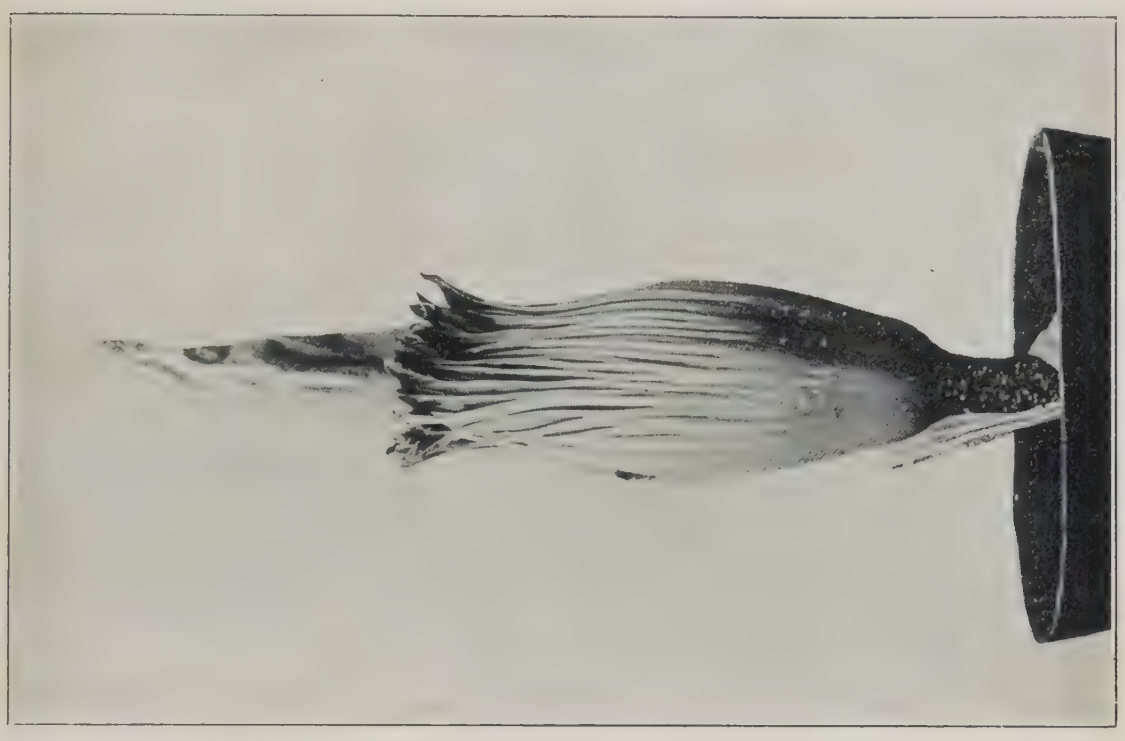

FIG. 2.

FIG. 1.

Amorphophallus Titanum at Kew. 1. At 11 a.m. 26th July, height 3 ft. 11½ in. 2. At 11 a.m. 1st Aug., height 5 ft. 6 in.

[*To face page* 374.

PLATE XI.

FIG. 4.

FIG. 3.

Amorphophallus Titanum at Kew. 3. At 11 a.m. 4th Aug., height 5 ft. 9 in. 4. At 5.30 p.m. 4th Aug., height 5 ft. 9 in.

To face page 375.]

1st being 5 feet $5\frac{3}{4}$ inches, and on August 4th, when the spathe opened, 5 feet 9 inches.

The spathe commenced to open at 9 a.m. on August 4th. By 2 p.m. it was fully expanded, and emitted a nauseating stench. Measurements at 2 p.m. were:—spadix 4 feet 9 inches long, $11\frac{1}{2}$ inches diameter; spathe 3 feet 3 inches long, 3 feet 9 inches diameter; peduncle 1 foot long.

At its period of fullest development the plant presented a handsome sight, the reflexed inner surface of the spathe being of a dark chocolate-brown, and the spadix butter-yellow. The outside of the spathe was pale greenish-yellow, and the peduncle dark green mottled with a lighter shade.

The flower remained open and in good condition until noon the following day, when it began to close. The spathe withered and the spadix collapsed finally some two days later.

XLVII.—ON THE FLORA OF THE NEARER EAST: II*.

W. B. Turrill.

Elymus delileanus *Schult.* Mant. ii. 424 (1824).

This species is widely distributed in the Orient. At Kew specimens are preserved from Cyrenaica (Derna), Egypt, Syria, Palestine, Iraq, and Persia. It is of interest to record that the species also occurs in Crete and that a specimen from Cape Sidero in the Sitia province is at Kew, *Gandoger* 1211. This specimen is named *Agropyrum cretense* Gdgr. and agrees with the description published in Gandoger, Flora Cretica, 107 (1916), under the name *A. cretense* Coust. et Gdgr. The name has to be reduced to a synonym of *Elymus delileanus* but the extension of this species into Crete is a matter of considerable phytogeographical interest.

Polypogon maritimus var. **subspathaceus** *Duby* in Bot. Gall. i. 508 (1828).

The specimen in the Kew Herbarium of *Gandoger* 860, which is named *Chaeturus creticus* Gdgr., I have definitely identified with *Polypogon maritimus* var. *subspathaceus* Duby. Since the specimen agrees with the meagre description given in Gandoger's Flora Cretica, 110 (1916), I can only reduce his name to synonymy. The locality is Creta: Prov. Sitia, Palaeocastro.

Juncellus distachyos *Turrill* comb. nov.—*Cyperus distachyos* All. Auct. 48 (1789).

The writer's reasons for keeping the genus *Juncellus* separate from *Cyperus* have already been given (*Kew Bull.* 1922, 123). C. B. Clarke while considering the above plant a *Juncellus* reduced it to a variety of *J. laevigatus* C.B.Cl. with the varietal name *junciformis* C.B.Cl. (in Hook., Fl. Brit. Ind. v. 597, 1893). A

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* Continued from *K.B.*, 1926, p. 106.

careful investigation of the rich material of this genus at Kew has made it apparent that *Juncellus distachyos* can be easily distinguished from *J. laevigatus* (L.) C. B. Clarke, a species originally described from South Africa. *Cyperus cossyrensis* Tineo appears to be conspecific with *Juncellus laevigatus* C.B.Cl., and four collections with the former name make up the only material at Kew from Europe of *J. laevigatus*. All other specimens named *Juncellus laevigatus* C.B.Cl. from Europe in the Kew Herbarium are now placed under *Juncellus distachyos* Turrill.

The Loranthaceae of the Balkan Peninsula.

The species of *Loranthaceae* occurring in the Balkan Peninsula are *Arceuthobium oxycedri* M.B., *Loranthus europaeus* (L.) Jacq., and *Viscum album* L. These three species, and the genera to which they belong, are morphologically very distinct one from another, and there is no evidence to suggest either that they have recently been derived from a common ancestor, or that any one of them has originated in the Balkan Peninsula. It is therefore postulated that their extension into and dispersal within the Peninsula has been independent for each species. Each of the three species is a woody, evergreen, half-parasite.

Arceuthobium oxycedri occurs on junipers, chiefly on *Juniperus oxycedrus* L. but occasionally on other species, and very rarely on other genera of the *Coniferae* (as *Cupressus*). *Loranthus europaeus* is parasitic chiefly on *Castanea* and species of *Quercus*. *Viscum album* grows on many woody plants as hosts. Three varieties or races are recognized from the Balkan Peninsula: var. *platyspermum* Kell. (var. *mali* Tubeuf) parasitic on broad-leaved trees, var. *abietis* Beck parasitic on firs, and var. *pini* Tubeuf parasitic on pines and occasionally on spruce. Some authors (e.g. Hayek in Prod. flor. balc. i. 100) have separated off the two varieties growing on conifers as a separate species under the name *V. laxum* Boiss. et Reut. Tubeuf (Monogr. d. Mistel) has, however, given good reasons for regarding them as three varieties or races of one species.

The general distribution of the three species as here accepted is:—*Arceuthobium oxycedri*: Portugal, Central and Southern Spain, South-eastern France, Balkan Peninsula, Crimea, Caucasus, Asia Minor, Armenia, Syria, N. Persia, Punjab, Algeria, Azores, Kenya.* *Loranthus europaeus*: Saxony, Czecho-Slovakia, Austria, Hungary, Roumania, Yugoslavia, Italy, Sicily, Balkan Peninsula, Asia Minor, Kurdistan, N.W. Persia. *Viscum album*: Central Europe north to England and Southern Scandinavia, Iberian, Italian and Balkan Peninsulas, Central and Southern Russia, Asia Minor, N. Persia, N. India, and Eastern Asia (as the var. *luteum* Makino and the var. *rubro-aurantiacum* Makino).

No other species of *Arceuthobium* occurs in Europe or in the

* See Turrill; ***Arceuthobium oxycedri*** and its distribution, in *K.B.*, 1920, p. 264.

Mediterranean Region and all except four of the 18 known species are confined to North America. The distinct species *Loranthus grewingkii* Boiss. et Buhse is fairly widely distributed in Persia and *L. acaciae* Zuccar. occurs in Palestine. *Viscum cruciatum* Sieb. is found in Spain, Palestine, and Morocco.

The Balkan Peninsular distribution* of the three species is:—

Arceuthobium oxycedri M.B.

2. Greece: Parnassus and Oeta Phthiotidis.
3. Thessaly: Chaliki, Krania, Klinovo, Sermeniko in the Pindus.
4. Epirus: Syraku at the foot of Mt. Peristeri.
5. Albania: Bogdan under Mt. Tomor; near Scutari.
6. North Macedonia: to the east of Lake Prespa; Thasos, Mt. Elias.

6a. South Macedonia: Nidze Planina; Naoussa, slope of Bermic ridge, south of Vodena; Mt. Xerolivadon, Belasitsa Planina.

7. Thrace: Tekir Dagh; Čanakča; Kalfa-Keoi; near Domouzdere; Dedeagač; Bodoma; Dervent.

8b. Rodope massif: above Bačkovo; above Stanimaka; south of Daridere.

10. Serbia: Maglič; Demeronji; Zimovinku; Borju; Čačanskoj.
11. Montenegro: Gomšice.
12. Bosnia: Tasovčič (?).
13. Herzegovina: near Mostar between Bura and Zitomišlic, in the Dubrava forest; Čitluk, near Kručevič on the Narenta, near Neum; Stolac district.
14. Dalmatia: above Slano; Lesina; near Trebocconi and Klujuč near Dernis and near Macarsca.
15. South Croatia: Lika Krbava above Zengg; Buccari; between Buccariza and Porto Ré; Cirkvenica; near Fiume.
16. Istria: Puzzole near Carcauzze, Dragogna valley, and near Borutto; Osero.

Loranthus europaeus Jacq.

2. Greece: near Hagios Petros, Mt. Malevo, Laconia; Kastanitza, Laconia; Taygetus; Messenia; Mt. Manglava, near Francovritzi on the R. Alpheus, near Leondari; Euboea, Mt. Dirphys; in Muntzuraki forest on Mt. Kukkos Phthiotis.
3. Thessaly; Mt. Baba, near Krania, at the Korona monastery; near Sermeniko in the Pindus; Mt. Othrys.
4. Epirus: Mt. Handja near the monastery Hag. Elias and near Luros in the district Philippiada.
5. Albania: Renci, district Scutari.

6a. South Macedonia: Belasitsa Planina; Hortiak forest near Salonika.

6b. Athos Peninsula: Kerasia.

7. Thrace: Kalfa-keoi; Dabrav; Ledšakeoi.

* See outline of scheme given in *K.B.*, 1924, p. 296.

8. North Bulgaria: Sredna-gora; Stara Planina; near Rahmanlij, Emineh Balkan; Kamčyk forests.
8b. Rodope massif; without exact locality; Pirin Planina.
9. Dobruja: Danube delta; forest of Cukarova.
10. Serbia: without exact locality.
12. Bosnia: numerous localities.
13. Herzegovina: numerous localities.
14. Dalmatia: Metcovic; Makarsca.
15. South Croatia: near Bunić and Graša.
16. Istria: Lippiza; Gropada; Mt. Cocusso; Mt. Slaunig; Trusche; between Tublje and the Slavnik chain; near Capodistria; Rozzo; Colmo; Draguč; Giuradi; Rizmanica; Lupoglava; Borutto; Caroiba.

Viscum album L.

1. Crete: Aphendi-Kavousi, Sitia.
2. Greece: Laconia, Taygetos; Attica, Parnes; Mt. Gerania.
3. Thessaly; near Chaliki, Krania, Klinovo, Velitsera in Pindus; Hag. Dionysios in Mt. Olympus.
5. Albania: Vallona district, Acroceraunia.
6. North Macedonia: Kriva-palanka.
6a. South Macedonia: Belasitsa Planina.
6b. Athos Peninsula: Mt. Athos.
7. Thrace: Kabakča; Avren; Tekir Dagh; Bosporus.
8. North Bulgaria: Loveč; Kamčyk forests; Aboba; Tirnova; Rasgrad; Longos forest near Varna.
9. Dobruja; forest of Cukarova.
10. Serbia: near Niš; near Belgrad.
12. Bosnia: numerous localities.
13. Hezegovina: numerous localities.
14. Dalmatia: near Unešič; Mt. Velebit.
15. South Crotia: near Fiume.
16. Istria: Mirarmar; Volosca; Contovelo; Grignono; between Pirano and Strugnano; near Corte d'Isola; above Isola; between Pisino and Lindaro; near Lončink; Capodistria.

Viscum album is the species with the widest general distribution and has likewise the widest distribution within the Balkan Peninsula. It is the only species occurring in Crete, and is found in both the Mediterranean and Central European domains. It is not known from the Cyclades, Epirus, Corfu, the Thracian islands, South Bulgaria, the Rodope massif, Novipazar, and Montenegro. In Greece it is known from the southern extremity of the Peloponnese northwards to Thessaly, and in the northern parts of our area it is known from Istria in the west to the Dobruja in the east. *Loranthus europaeus* is the species with the least wide general distribution but is the one with the second widest distribution within the Balkan Peninsula. It is not known from Crete, the Cyclades, Corfu, North Macedonia, the Thracian islands, South Bulgaria, Novipazar, and Montenegro. *Arceuthobium oxy-*

cedri has the second widest general distribution of our three species and the least wide Balkan Peninsular distribution. It is unknown from Crete, the Peloponnese, the Cyclades, Corfu, the Athos Peninsula, the Thracian islands, North Bulgaria, South Bulgaria, the Dobruja, and Novipazar. It is thus much more limited in the south and north-east than the other two species. The absence of *Juniperus oxycedrus*, the commonest host plant, in most of the north-east parts probably accounts for its limitation in that direction. Its distribution in Serbia is limited to those southern parts where *J. oxycedrus* occurs in enclaves of Mediterranean vegetation. However, this host plant is also found abundantly in Crete, the Peloponnese, and the Cyclades, where the parasite is unrecorded. An explanation of the last peculiar fact is still to seek. The long-distance distribution is certainly by birds*, pollination is mainly or entirely effected by insects†, and the supposed need for liquid water at germination‡ is as likely to be fulfilled in Crete or Greece as in other portions of the Mediterranean domain.

The genus Phagnalon in the Balkan Peninsula.

P. methanaeum Hausskn. This species is limited to Argolis: in rup. paenins. Methana pr. Vromolimni (*Haussknecht*) (Herb. Kew); ins. Hydra, in muris et rupibus (*Heldreich*) (Herb. Kew) and according to Hal. Consp. ii. 27 also in Aegina and ins. Jos (Ios) Cycladum. It is closely related to *P. graecum* but distinguished by the narrower, entire, usually longer leaves, and the broader, shorter, more spreading phyllaries of the involucre. There is also a morphological resemblance to the western *P. saxatile* Cass.

P. graecum Boiss. et Heldr. is widely spread in Thessaly, Greece and the Cyclades, and Crete. Outside the Balkan Peninsula it occurs in western Asia Minor. The records for Italy, Sicily, Malta, Lampedusa, and North Africa are uncertain. The plants quoted by Halácsy from the Ionian Islands are either *P. rupestre* DC. or intermediates between this species and *P. graecum*.

P. rupestre (L.) DC. This species is of wide occurrence in the Mediterranean Region, south, east, and west of the Balkan Peninsula. The specimens from the Balkan Peninsula which I have seen and refer to it are all from the western parts—Dalmatia and the Ionian Islands—and are neither quite equal to the common variety nor quite uniform amongst themselves. The Dalmatian plants have been taxonomically considered as *P. rupestre* subsp. *illyricum* by Ginzberger in Oesterr. Bot. Zeitschr. lxx. 197 (1921). On the whole they indicate that *P. rupestre* is vicarious with *P. graecum* towards which they verge. In Corfu it would appear

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* *K.B.*, 1920, p. 267.

† Tubeuf, Die Arten der Gattung *Arceuthobium* (*Razoumowskia*), in Naturwiss. Zeitschr. f. Forst- u. Landwirtsch. xvii. 167 (1919).

‡ Heinricher, Berichtigende Mitteilung über die Keimungsbedingungen der Samen von *Arceuthobium oxycedri*, in Ber. deutsch. bot. Ges. xxxv. 204 (1917).

that the two species meet and either hybridize or have fused, unless, as is possible, *P. graecum* originated as a morphological unit in the southern Adriatic district and spread thence into the eastern and southern parts of the Balkan Peninsula, where it is isolated from *P. rupestre*, but is not isolated in the southern Adriatic district. The critical examination of a series of Italian specimens might throw further light on the problem, but field studies and breeding work are alone likely to solve it. One specimen from Herb. Alexander Prior with one of Sieber's Cretan labels is exactly the same as the Dalmatian plants, and I suspect some mixing of labels.

P. pumilum S. et S. A well-marked species endemic to one mountain group in Western Crete. It is divisible into two varieties:—

α *tomentosum* Raul with the stems, leaves and phyllaries more or less white-tomentose.

β *glabrum* Boiss., with the stems, leaves and phyllaries glabrous.

The geographical distribution of the two varieties is as follows:—

α in rupestribus ad nives in H. Pneuma (Aspronuma) (*Baldacci* 125 in Herb. Kew); in summ. mt. Sphak. (*Sieb.* in Herb. Kew).

β in fissuris rupium in Gigilos Volakia ad aquem Luerfoli distr. Sphakia (*Baldacci* 71 in Herb. Kew); in summis montib. Sphacioticis Cretae alt. 7000 ft. (*Heldreich* in Herb. Kew); Sphakia in fissuris rupium mtis Hagis pneuma et Stravpodia 7000 ft. (*Heldreich* in Herb. Kew).

The morphological affinity is with *P. kotschyi* Sch. Bip. from Syria and Kurdistan. While the capitula of the two species are very similar the habits are quite distinct. *P. pumilum* is a dwarf high mountain plant growing in the fissures of rocks. At flowering it sends up leafless, or almost leafless, unbranched peduncles, 1 to 4 cm. high and terminated by a single capitulum. *P. kotschyi* is likewise usually a high mountain rock plant, but it has elongated leafy prostrate or ascending stems, which often branch below, or up to the middle, the branches finally ending each in a single capitulum. I am thus forced to regard *P. pumilum* as an old species or type which reached Crete, when this island was joined to an eastern continental mass, either as the species we now know or at least as a species morphologically closely related to it and to *P. kotschyi*.

XLVIII.—THE PROPAGATION OF CAMPHOR.

J. J. Blackie, R. T. D. Graham and L. B. Stewart.

In the majority of books the method recommended for raising Camphor commercially is by sowing of seed. Experience has shown that seedlings vary considerably in the percentage of camphor they produce. Even where seed is collected from a high grade tree the

seedlings are far from uniform. In certain areas to ensure uniformity of yield throughout a plantation vegetative propagation has been resorted to. Crevost & De Fenis* record in Tonkin that Camphor may be propagated by cuttings, layering, and grafting, as well as from seed.

Macmillan† places seed sowing first as the commercial method of establishing a plantation, but states that root cuttings are comparatively easy to strike whereas branch cuttings prove refractory.

Reproduction by branch cuttings has been experimented with in the Royal Botanic Garden, Edinburgh. Certain plants proved easy to propagate whereas one plant with apparently a much higher Camphor content proved refractory. A method of successfully rooting branch cuttings from the high grade tree was discovered and later an analysis of the plant was carried out.

Fresh green leaves—1·2 per cent. Crude Camphor.
Stems under $\frac{1}{2}$ inch diameter—·1 per cent. Crude Camphor.
Stems over $\frac{1}{2}$ inch diameter—·03 per cent. Crude Camphor.

These figures show that the leaves of the plant compare favourably with those of the plant commercially used for the production of Camphor in its natural habitat.

Twigs from this plant were difficult to root unless specially prepared. The method employed was to cause the twigs, subsequently to be used as cuttings, to develop for a time in darkness prior to their removal from the parent tree. A period of 14 days gave the most satisfactory results under the conditions obtaining in June-July at Edinburgh. Microscopic investigation‡ revealed the fact that extensive anatomical changes resulted from blanching or etiolating the twigs. It is considered that these changes contributed to the successful rooting of these twigs. The twigs after treatment were placed in a tropical propagating frame (75° F.). A copious supply of water assisted callus formation and roots soon appeared.

This method may not be practical in a forest but it is suggested that a modification may prove useful. If a high grade tree were found it might be advisable to cast the tree and layer the branches. In this way there is a possibility of obtaining a standard of high grade plants.

XLIX.—DISEASES OF ECONOMIC PLANTS IN THE AZORES. Mathilde Bensaude.

A preliminary survey of the fungous diseases of crop plants of the island of St. Michaels was carried out from September to December, 1923. With a few exceptions the diseases reported are of common occurrence wherever the host plants are cultivated.

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* Crevost, Ch. & De Fenis, F.: Bull. Ec. de l'Indochine; xxiv, 1921.
† Macmillan: Tropical Gardening and Planting; 1925.
‡ Reid, O.: Trans. Bot. Soc, Edinburgh; xxviii, 1923.

In St. Michaels the prevalence of fungous diseases is general, due mainly to the high atmospheric humidity and the continuous growing season. The winters, in fact, are not severe enough and the summers not hot and dry enough to check plant growth and the propagation of fungi. As can be seen from the table following, the climate in the island is temperate throughout the year and the rainfall is rather high. During 1923 the average relative humidity is given as 74.74, and except for three days in August and one in September clouds were recorded throughout the year ; the annual rainfall in 1923 was registered, at an altitude of 175 metres, as 811.4 mm. The year was unusually rainy from February to May and exceptionally dry from June to November. The lowest and highest mean temperatures were 14·62° C. for March and 22·96° C. for August respectively.

Meteorological Observations Registered in St. Michaels from 1894 to 1923.

Months.	Average monthly temperature. Degrees centigrade.	Average monthly rainfall in mm.
January	14·63	114·2
February	14·34	124·1
March	14·35	92·3
April	15·35	80·4
May	16·81	88·7
June	19·06	53·7
July	21·35	32·2
August	22·37	51·1
September	21·22	97·7
October	19·02	132·2
November	16·98	144·6
December	15·65	124·4
Average	17·59	95·2 1125·6 mm. Total rainfall during one year.

Cereals.

Maize. Rust (*Puccinia Sorghi*).—The maize yield in 1923 was exceptionally fine. This crop is extensively grown in the island from sea level up to an altitude of 700 to 800 metres. The only disease observed was rust, characterized by the yellow streaks on the leaves. Both teleuto- and uredo-sori were found in every case. Almost every plant was infected but no apparent harm was caused. No traces of aecidial sori were found on the leaves of *Oxalis* sp. growing in the vicinity.

Root Crops.

Sugar Beet.—This crop is widely cultivated and supplies one important sugar factory. The agricultural adviser attached to this factory, Mr. A. de Freitas Pereira, reports the following fungi as occurring on beet:—rust (*Uromyces betae*), leaf spot (*Cercospora beticola*), *Sclerotinia libertiana*, *Sphaerella tabifica* and *Typhula variabilis*. The last is, in his opinion, the most destructive and causes up to 50 per cent. rot of the roots in certain fields. It is especially severe where root knot (*Heterodera radicicola*) has been found simultaneously. The disease has frequently been observed in fields hitherto not cultivated for beet.

During the late summer and autumn only two fungous diseases of beet were found, the most striking being the leaf spot (*Cercospora beticola*). Approximately 100 per cent. of the plants in the majority of fields were attacked, in most cases the tops becoming completely scorched by the middle of August. The peasants attributed the scorching of the leaves exclusively to the dry weather. After the roots are formed the premature destruction of the foliage is considered quite unimportant by the growers. The people at the factory, on the contrary, attribute the usual low sugar content of the sugar beet grown on the island to this and other leaf diseases.

A root rot was also observed, destroying some 30 per cent. of the roots in one field which was infected by *Heterodera radicicola*. The roots turn brown, remain fairly hard and interior cavities are formed. These, as well as the surface, are covered with a fluffy white mycelium and small round sclerotia about 1 mm. in diameter. This growth is attributed by Mr. A. de Freitas Pereira to *Typhula variabilis*, and his diagnosis is probably correct. No perfect stage, however, has yet been observed.

Red Beet, Swiss Chard Beet.—Leaf spot (*Cercospora beticola*); in a kitchen garden in November and December.

Carrots.—Mildew (*Erysiphe* sp., probably *E. polygoni*); early in September on carrots grown between banana plants. The tops were scorched and the roots remained undersized.

Vegetables.

Cabbage.—Black rot (*Pseudomonas campestris*) was observed on white head cabbages. Kale growing in the vicinity remained healthy. Leaf spot (*Mycosphaerella brassicola*) frequent on both kale and cabbage.

Celery.—Leaf spot (*Septoria apii*); a slight infection was seen in one vegetable garden.

Onion.—Black mould (*Sterigmatocystis nigra*); general on yellow onions at the market of Ponta Delgada.

Parsley.—Leaf spot (*Septoria petroselini*); observed during November. The plants were not killed but the leaves were badly scorched.

Peppers (*Capsicum annuum L.*).—Leaf mould (*Cladosporium* sp.); during September, October, and November, on plants grown in several gardens. The symptoms are olivaceous velvety patches on the lower surface of leaves ranging in diameter from 1 to 1·5 cm. The leaves become yellow and drop. The causal organism is apparently identical with, or resembles very closely, *C. herbarum*. Mosaic distortion and characteristic mottling of the leaves were frequently observed.

Potato.—Blight (*Phytophthora infestans*) is very serious in the island, as might well be expected from the prevalence of high atmospheric humidity and the even mildness of the temperature during the whole year.

Virus diseases (leaf roll and mosaic). The latter was much more prevalent than the former. On Magnum bonum and a purple unnamed variety, grown on the island for the last twenty years, a very high percentage of severe mosaic was observed.

Common scab (*Actinomyces scabies*) and rot caused by Blight were the only tuber diseases observed.

Pumpkins, Squashes.—By September all vines were attacked by mildew (*Erysiphe* sp.). The leaves, when badly infested, appear scorched and die prematurely. The flowers and fruit sets are apparently absolutely immune.

FRUIT.

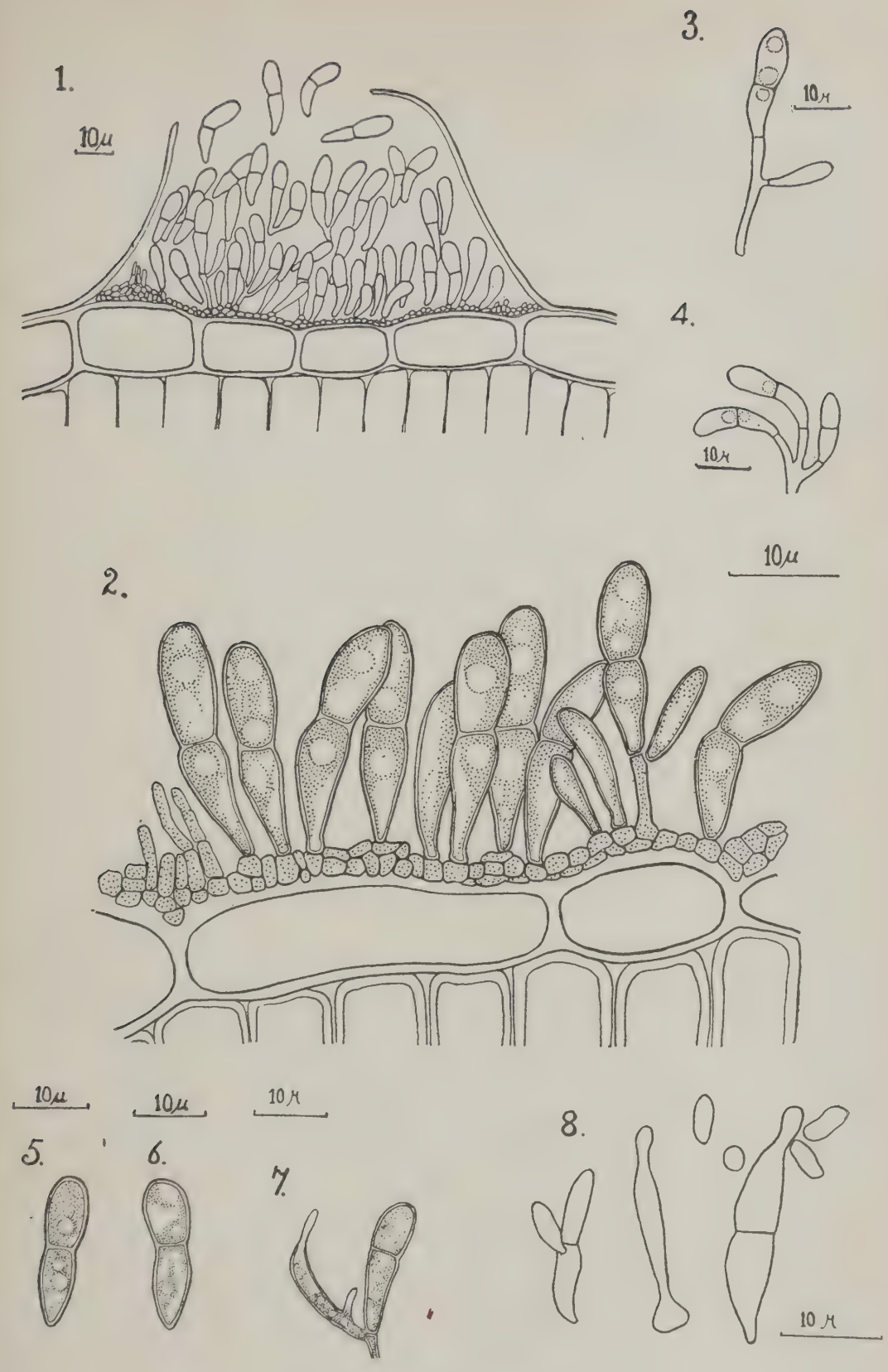
Apples.—Bitter rot (*Glomerella cingulata*). This fruit rot is very common in the island and attacks 100 per cent. of the fruit of certain varieties as soon as it ripens. A few mummified apples of the previous season's crop were seen hanging in the orchard.

Leaf spot. A species of *Phyllosticta* caused frequent spotting of the leaves of apples of many varieties. The lesions are light brown, circular clean cut, visible on both sides of the leaf, from 0·5 to 3 mm. diameter. Pycnidia are scarce. The pycnospores are obtuse, hyaline, biguttulate, and measure 5 μ by 1 μ.

Leaf spot (*Marssonina* sp.). The disease was found on almost every tree of two relatively large orchards in November and December, and the fungus causing it is possibly identical with *Marssonina mali* Henn.* Occurring so very late in the season it did not cause any damage whatever. The infected leaves become yellow, showing numerous green blotches of irregular and rather indefinite contour. These green marks vary in size from 0·5 to over 1 cm. On careful examination one or several acervuli can be seen in every green strand. On fresh material the acervuli measuring from 90 to 150 μ appear, when examined with a hand lens, like minute raised translucent domes; on dry leaves they become wrinkled and brown.

On cross sections the structure of the lesions is easily understood. The fungus develops entirely between the epidermal cells and the cuticle, which is raised and distended and finally broken by the

* *Miyake*, Ichiro in Botan. Magaz. 21 : 40–54, Tokyo, 1907.



Marssonina (mali ?)

1. Cross section through an acervulus, host cells and stromatic layer (slightly diagrammatic). 2. Detail of stroma and spore attachment (host cells somewhat diagrammatic). 3 & 4. Branched conidiophores and immature conidia. 5 & 6. Mature conidia. 7. Mature conidium; an immature conidium is budding off small sporules. 8. Conidia budding off sporules in moist chamber.

pressure of the numerous ripening spores. (Fig. 1.) A narrow brown stromatic growth develops on the epidermal cells, these become markedly discoloured with a brown content and slightly flattened. The spores arise from this stromatic layer: some are sessile, others are borne on conidiophores, the length and appearance of which, as may be seen from the accompanying figures, varies greatly. (Fig. 2.) Conidiophores continue to elongate for a long while, budding offside branches basipetally on which new spores are formed. (Figs. 3 and 4.) The spores are bicellular, hyaline with a thin wall and a granular protoplasm, in which two or more large oil globules are fairly constant when they approach maturity. The spores are asymmetric in relation to both the perpendicular and the horizontal planes; the top cell is generally broader than the lower one and often, although not always, longer. The mature spores vary in size from 20 to 30 μ long by 6 to 7 μ wide. (Figs. 5 and 6.)

The *Marssonina* found in the Azores is somewhat different from *Marssonina mali* Henn. as recorded by Dr. Miyake on apple leaves in Japan. The presence of well developed, unbranched conidiophores (5 to 8 μ long by 1·5 to 2 μ wide) seems to be constant in Japanese material. The spores, although very similar in shape to those of the *Marssonina* found in St. Michaels, are markedly shorter, measuring from 14 to 20 μ long by 4·5 to 6 μ wide.

The morphological differences might perhaps warrant the creation of a new species. The differences in size depend, however, in all probability on variation in prevailing conditions and it is better to refrain from definitely establishing a new species until an opportunity occurs of comparing specimens and cultures from both countries.

All attempts at germinating this fungus were unsuccessful whether in distilled water, tap water, on water agar, or potato agar. Further attempts will be made. In cross sections of leaves which had been left for a couple of days in a moist chamber it was found that in many of the acervuli the immature spores of *Marssonina* were budding off small hyaline spores about 5 μ long by 2 to 3·5 μ wide. (Figs. 7 and 8.) Data concerning overwintering and period of infection are wanting.

All efforts of the writer to find either Apple scab (*Venturia inaequalis*) or pear scab (*V. pirina*) in orchards or in the market were fruitless. The absence of scab is very noteworthy, considering that most fruit stock is imported from the Portuguese mainland where these diseases are of general occurrence. The quarantine service in the island is so very inadequate that scabbed trees must certainly be imported every year and it would appear that climatic conditions alone must explain the absence of this disease in the island.

Bananas.—Ripe rot or Anthracnose (*Gloeosporium musarum*). This was frequently observed forming numerous brown, depressed,

clear cut lesions on ripe fruit. *Musa cavendishii*; the variety cultivated has up to now been grown only for local consumption. Experiments on the export value of the crop are under way.

Fig. Rust (*Kuehneola fici*).—The uredo stage of this rust was observed on fig trees all over the island, causing premature defoliation. The fruit is also attacked but seems to suffer more from the exposure to wind and sun owing to defoliation than from the direct effects of the parasite.

Grape.—In one garden under observation powdery mildew (*Uncincula necator* Burr.) caused much damage, particularly on the white varieties of *Vitis vinifera*. Varieties of *Vitis labrusca* showed either only a slight russeting of the infected berries or appeared quite immune, with no sign of the fungus on the berries.

Brown rot (*Botrytis cinerea*) developed on muscat and chasselas following the outbreak of powdery mildew.

Downy mildew (*Plasmopara viticola*) developed to a slight degree during September and October on leaves and vines which had been sprayed late in July with bordeaux mixture.

Cluster rot (*Physalospora baccae* Cav.). This disease, so aptly named by Nishikado,* destroyed the entire crop in a large garden in which varieties of *Vitis vinifera* and *V. labrusca* were grown. The symptoms appear on mature or almost mature clusters; the pedicels dry, the bunch wilts suddenly, and the berries become flaccid and many of them drop. On sectioning such berries, one finds that the pulp is abnormally watery and that the vascular tissue in the vicinity of the seeds has become brown. Berries which do not drop, whether of the white or dark varieties, turn lavender in colour, gradually become wrinkled and are finally transformed into somewhat tough purple-brown mummies. The surface of these is covered with tiny dark pycnidia from which, after a few days, white spore masses ooze.

A microscopical examination of a flaccid berry shows that the pulp is penetrated throughout by intercellular, hyaline hyphae about 5 μ in diameter. The pycnidia and spores of this fungus correspond absolutely in shape and measurements to *Macrophoma reniformis* as described by Viala and Ravaz.† Both the macroconidia (20 μ long) and the microconidia (5 μ long) were found on the berries; the perfect stage, however, was not observed. A culture started from a single macroconidium on grape juice agar produced, after twenty days, typical pycnidia with perfectly normal macroconidia.

Peaches.—Scab (*Cladosporium carpophilum*) caused spotting and cracking of fruits, and on some varieties of peaches very severe defoliation.

Shot hole (*Coryneum beijerinckii*) is common on the leaves of all

* *Nishikado*, J. Ann. Phytopath. Soc. Japan. I, part 4 : 20–41, 1921.
† *Viala & Ravaz*, Le Black Rot. Montpellier, 1886.

stone fruit trees. Spotting and cracking of peaches was also observed.

Rust (*Puccinia pruni-spinosae*). Uredo- and teleuto-spores were observed on peach leaves in September, October, and November, the defoliation caused was very slight. The aecial stage on Anemones has so far not been observed.

Plums.—Rust (*Puccinia pruni-spinosae*), found on leaves of *Prunus domestica*.

Shot hole (*Coryneum beijerinkii*) was common on the leaves of European and Japanese varieties of plums. The fruit was not affected.

Melon.—Powdery mildew (*Erysiphe* sp.). Bad outbreaks of this disease were observed in several localities.

Miscellaneous.

Tea.—The tea bushes grown in the island are mostly of the small Chinese variety, the Assam large-leaved tea bush is grown only by a few planters.

Red rust (*Cephaleuros mycoidea* and *C. parasitica*). A rust coloured, hairy, algal growth was observed on the twigs and leaves of the bushes in one garden about twenty years old, in which manuring and cultivation had been badly neglected since the beginning of the war, and in which pruning and close plucking of the worst type was annually practised. Specimens of infested twigs and leaves sent to the Imperial Bureau of Mycology at Kew were kindly examined by Mr. Mason, who recognized the well-known so-called red rust of Ceylon, recently investigated by Petch.* The growth on the leaves is, according to this author, *C. mycoidea*, a saprophyte, and that on twigs, which produces a gray discoloration of the bark and a die back of young wood, *C. parasitica*.

A species of *Cephaleuros*, probably *C. mycoidea*, was found on the leaves of rose bushes and trunks of *Cryptomeria japonica* grown in the vicinity of the tea bushes. Apparently, however, the presence of this *Cephaleuros* was not harmful to the plants.

Gray blight (*Pestalozzia theae*). Typical gray patches at the extremity and margins of the leaves were observed. The causal organism corresponds in every respect to that found in Japan, Ceylon, etc. Only weak bushes are attacked, and usually only the older leaves are blemished.

Brown blight (*Colletotrichum camelliae*) was also observed on weakened bushes; this, and the previous named disease, are of small economic importance.

Box.—Leaf rust (*Puccinia buxi*). The teleuto sori of this rust were found on all the bushes.

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* *Petch*, T. Tropical Agriculturist, lvii, part 3, pp. 188–192, 1921.

Camellia.—Gray blight (*Pestalozzia guepini*), on leaves of bushes weakened by drought or poor tillage; the same fungus caused also a die back of twigs.

Roses.—Mildew (*Sphaerotheca pannosa*) very common.

Rust (*Phragmidium subcorticatum*) caused defoliation in certain varieties of roses.

Crown gall (*Bacterium tumefaciens*) in one case at the base just below soil level.

Violets.—Leaf spot (*Cercospora violae*) commonly observed in most gardens.

L.—REVISION OF THE AFRICAN TODDALIEAE. I. C. Verdoorn.

The present paper is an attempt at a revision of the African genera and species of the tribe *Toddalieae* of the family *Rutaceae*. Great difficulty had been experienced in South Africa in naming specimens belonging to this group, on account of the diverse views with regard to the limits of both genera and species. In many respects this was due to imperfect knowledge of the group in general, and also perhaps to the flowers being unisexual or polygamous.

A preliminary revision of the South African material was undertaken in the National Herbarium, Pretoria, with the intention of its being completed at Kew. It was then evident, however, that a complete review of the whole of the African species of the group was necessary for the result to be at all satisfactory.

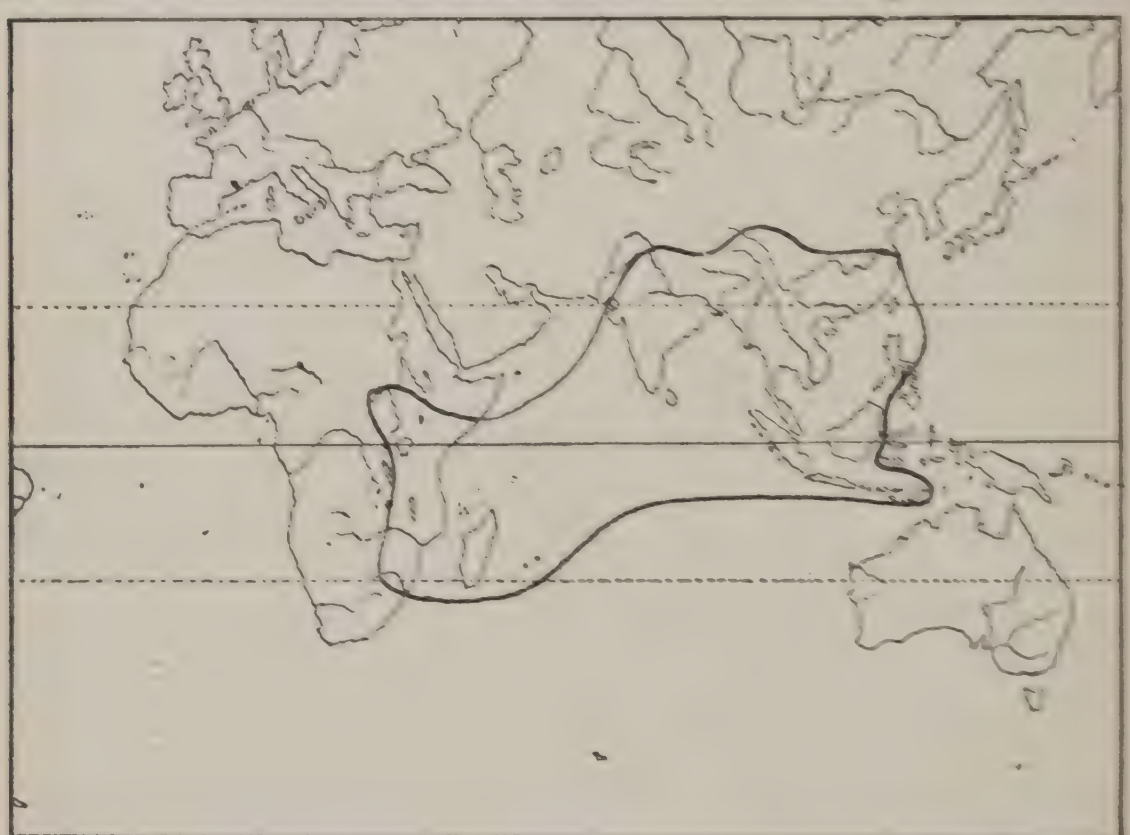
I am much indebted to the Director of the Royal Botanic Gardens, Kew, for facilities in carrying out this work, to the Keeper of the Department of Botany, British Museum (Natural History), South Kensington, and also to Dr. L. Diels (Berlin), Prof. Lecomte (Paris), and Prof. Dixon (Dublin) for the loan of type specimens. My greatest debt of thanks is due to Mr. J. Hutchinson who has guided and assisted me with the entire compilation, especially with regard to the points on evolution, the theories put forward on this subject being in agreement with his ideas.

The tribe *Toddalieae* in Africa is represented by trees and shrubs with alternate or subopposite, digitately compound or unifoliolate leaves, unisexual or polygamous flowers, united or free carpels with a single terminal style, and fleshy indehiscent fruits. The family *Rutaceae* is no doubt considerably advanced in its floral structure, and although in some genera we meet with comparatively free carpels, the freedom in this case is probably *secondary* and not primitive, because the carpels are connected by a single common style. Those genera with *free* carpels are therefore considered to be more advanced than those with united carpels. With regard to the leaves, those genera or species with the greater number of leaflets are more primitive than those having only a single leaflet,

the latter being clearly a case of reduction. This is very well shown in the genus *Araliopsis*, which has 5 leaflets and united carpels and is taken to be the most primitive member of the group under review. This tendency to reduction to a single leaflet is evident in representatives of at least two genera and sometimes occurs on the same plant with the normal type of leaf.

Value of Characters.

Generic characters.—As the group is apparently a very homogeneous one, there are few characters on which to separate the genera satisfactorily. For want of anything better I have had to rely mainly on the relative number of stamens and petals, but the more numerous stamens seem to be correlated with a greater number



Range of Toddalia asiatica *Lamk.*

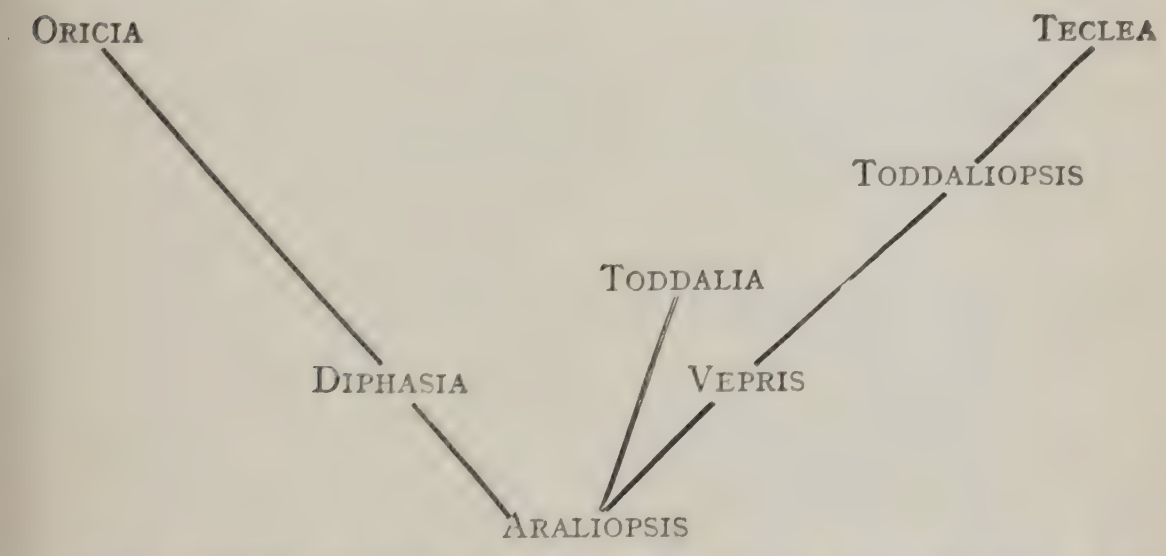
of ovary cells, and the genera showing this combination, i.e., *Vepris* and *Toddaliopsis*, are separated from the others by these characters. The number of ovary cells seems a good character for dividing *Toddalia* (4–7-celled) from *Teclea* (1-celled) and *Diphasia* (2-celled).

Specific characters.—Owing to the lack of good herbarium specimens I have endeavoured to frame the keys to the species on the more obvious characters such as inflorescence, number and shape of leaflets, number and evidence of gland-dots, and the indumentum.

Geographical Distribution.

With the exception of *Toddalia* and *Vepris* all the genera are confined to Africa and the Mascarene Islands. *Toddalia* (see map)

ranges from the Transvaal along the East African plateau, the Mascarene Islands to South Eastern Asia, where in the Malay Archipelago it scarcely extends beyond "Wallace's Line." *Vepris* is represented outside Africa by a single species only, *V. bilocularis* Wight & Arn. It occurs in India only in the state of Travancore on the Western side of the peninsula. The genus most widely spread over Africa and the Mascarene Islands is *Teclea*, and it is noteworthy that it possesses the most advanced characters in the group. *Oricia*, another advanced genus in which the carpels have become free, is also fairly widely spread, ranging from French Guinea through the Congo Basin as far South as the Transkei. The remaining genera are very small and are quite locally distributed, *Araliopsis*, which perhaps shows the most primitive characters, being found only in the Gabon region, where such relics are somewhat numerous. *Diphasia*, a nearly allied genus, has a slightly wider distribution as far as Angola. The remaining genus, *Toddaliopsis*, is endemic to Zanzibar and thus occurs within the range of its most nearly allied genus *Vepris*.



The diagram above shows the phylogenetic relationship of the genera under review.

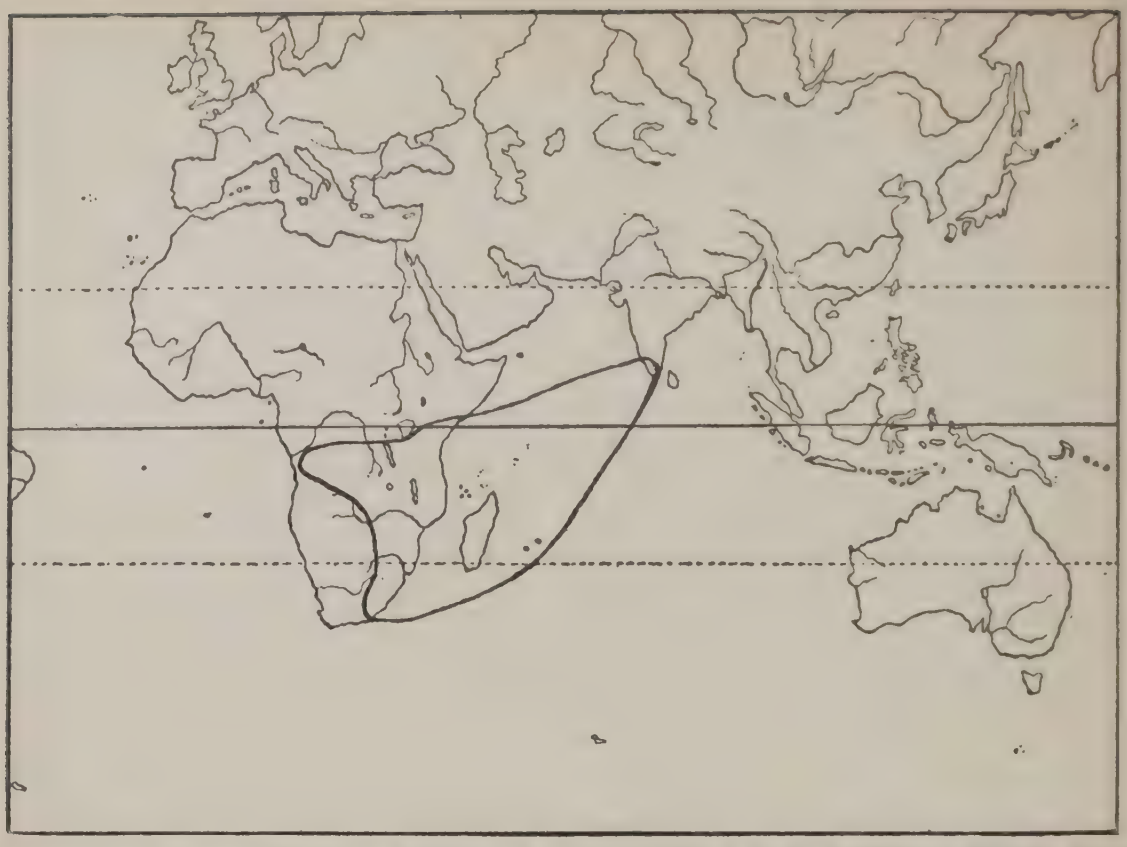
Imperfectly known species.

Teclea ? acuminata Engl. in Engl. Bot. Jahrb. 36: 245 (1905). This specimen, which has a long style overtopping the stamens, probably does not come into the tribe *Toddalieae* at all. The material is insufficient to place it correctly.

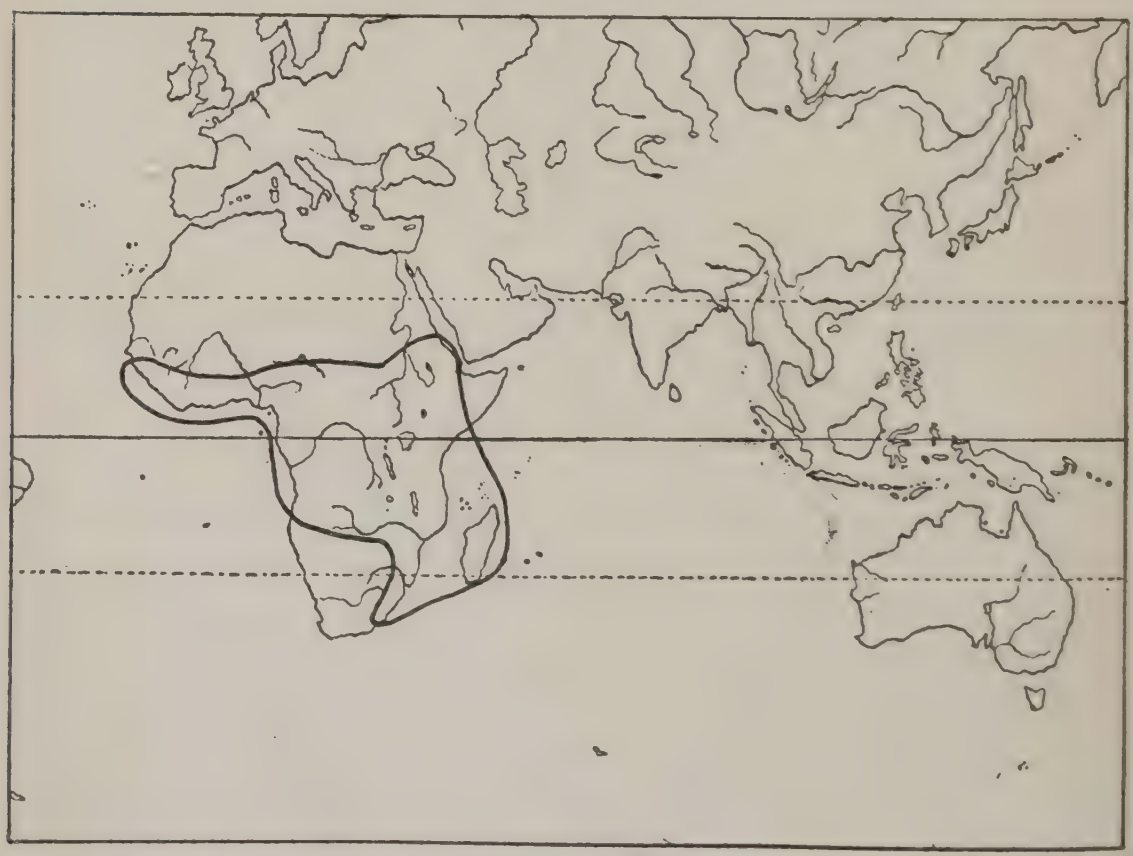
Teclea salicifolia Engl. l.c. 244 (1905). I have not seen this specimen and cannot place it from the description.

Teclea utilis Engl. l.c. 245 (1905). Described from leaves only and it is therefore impossible to assign it to its correct genus.

Teclea spathulata Engl. Pflanzenw. Afr. 3, 1: 757 (1915). The description is so meagre that I have been unable to classify it. I have not seen a specimen.



Range of genus Vepris, showing an interesting link between South East Africa and the Indian Peninsula.



Range of Teclea.

Teclea gracilipes Engl. in Engl. Bot. Jahrb. 54: 308 (1917). Described from leaves only.

Teclea ebolowensis and *Teclea heterophylla* are placed by Engler under *Teclea* in Pflanzenw. Afr. 3, 1: 756 (1915). In Bot. Jahrb. 54: 305 (1917) he describes them as *Toddaliopsis ebolowensis* and *Toddaliopsis heterophylla*, with no reference to his previous citations. I have not seen the specimens, and since the fruits are unknown it is impossible to say to which genus they belong.

Key to the genera of the African TODDALIEAE.

Fruit fleshy, of 4 united carpels, the carpels with a large concave pit on the inside of the upper half, 2-seeded; leaves very large, 5-foliolate; West Tropical Africa.....1. **Araliopsis.**
Fruit fleshy, of 1–7 united or 2–4 free carpels, carpels not pitted, 1-seeded; leaves 1–3-foliolate, very rarely 5-foliolate (*Oricia*) but then carpels free at maturity:
  Stamens or staminodes more than the number of the petals, usually twice as many; ovary 2- or more celled:
    Seeds with endosperm; fruit not warted; Tropical and South Africa, Mascarenes .....2. **Vepris.**
    Seeds without endosperm; fruit strongly warted; Zanzibar.....3. **Toddaliopsis.**
  Stamens or staminodes as many as the petals; ovary 1–7-celled:
    Carpels united or carpel solitary:
      Ovary 4–7-celled; scramblers, usually armed with prickles; South and Tropical East Africa, Mascarene Islands.....4. **Toddalia.**
      Ovary 1–2-celled; trees or shrubs; branches unarmed:
        Fruit and ovary 1-celled; South and Tropical Africa and the Mascarenes.....5. **Teclea.**
        Fruit and ovary 2-celled; West Tropical Africa 6. **Diphasia.**
    Carpels 2–4, more or less free, becoming quite free in fruit, or 1–3 aborting but evident; West Central and South Africa.....7. **Oricia.**

1. **Araliopsis** *Engl.* in Engl. & Prantl, Pflanzenf. 3, 4: 175 (1896).

Trees. *Leaves* large, leathery, 5-foliolate, gland-dotted. *Panicle* stout, spreading. *Flowers* 4-merous. *Fruit* fleshy, about 1 cm. in diameter, consisting of 4 united carpels; carpels with a large concave pit on the inside of the upper half, 2-seeded.

A. Soyauxii *Engl.* in Engl. & Prantl, Pflanzenf. 3, 4: 177, fig. 101 A'–D' (1896).

Trees with large thick leaves. *Petioles* stout, about 15 cm. long; leaflets oblong-obovate, rounded or shortly acuminate at the apex, cuneate at the base into a petiolule, 15–22 cm. long, 7–8 cm. broad; petiolule up to 2 cm. long. *Flowers* 4-merous; panicles

stout, spreading. *Fruit* fleshy, more or less globose, about 1 cm. in diameter, consisting of 4 united carpels; carpels with a large concave pit on the inside of the upper half, 2-seeded.

Tropical Africa. Gabon: Sibange Farm, Munda District, *Soyaux* 97.

2. **Vepris** *Comm.* ex *A. Juss.* in Mem. Mus. Par. 12: 509 (1825): Engl. & Prantl, Pflanzenf. 3, 4: 178 (1896).

Unarmed *shrubs* or *trees*. *Leaves* digitately 1–3-, rarely 2–4-foliolate, gland-dotted. *Flowers* unisexual, in terminal and axillary racemes, cymes or panicles. *Calyx* cup-shaped, 4-lobed. *Petals* 4. *Male flower*: stamens 8, usually 4 long and 4 short (in an Indian species, *V. bilocularis*, the calyx is 2-lobed, petals 2 and stamens 4); ovary rudimentary, 2–4-angled or with 2–4 styles. *Female flower*: staminodes 8; ovary 2–4-celled. *Fruit* 2–4-celled, sometimes 1 cell only developing and the others aborted, cells 1-seeded; endosperm present.

Widely distributed through South Africa, East Tropical Africa and the Mascarene Islands; also in India.

Excluded species:—*Vepris ? angolensis* Engl. = Clausena melioides *Hiern*.

Ovary 3–4-celled; rudimentary ovary with 4 styles:
- Stems and petioles pilose; Madagascar...(1) *V. schmidelioides*.
- Stems and petioles glabrous:
  - Leaves 3–4-foliolate:
    - Fruit 4-lobed; inflorescence a terminal panicle; leaflets lanceolate to elliptic, strongly undulate at the margins; South and East Africa, Mascarene Islands. (2) *V. lanceolata*.
    - Fruit 8-ribbed; inflorescence a terminal panicle; leaflets 2–4, obovate-elliptic, large and leathery, 13–16 cm. long, 6–8 cm. broad; Madagascar....(3) *V. macrophylla*.
    - Fruit not ribbed or lobed; inflorescence composed of axillary panicles; leaflets oblanceolate, 7–13 cm. long, 2.5–4 cm. broad; petioles and fruit drying black; East Africa.....(4) *V. Stolzii*.
  - Leaves unifoliolate:
    - Leaflets oblong-obovate, 10–14 cm. long, 3·5–6 cm. broad; fruits pointed and deeply pitted; Madagascar.....(5) *V. nitida*.
    - Leaflets obovate or oblong-cuneate, 4–5 cm. long and 1·5 cm. broad; Madagascar.....(6) *V. Elliotii*.

Ovary 2-celled; rudimentary ovary usually with 2 styles:
- Stems and petioles tomentose:
  - Leaflets about 7 cm. long; petioles winged; fruit pitted; Madagascar.....(7) *V. pilosa*.
  - Leaflets about 4 cm. long; fruit not seen:
    - Petioles winged; inflorescence of axillary and terminal panicles; Northern Rhodesia.....(8) *V. zambesiaca*.

Petioles terete; inflorescence of short axillary cymes; Tanganyika.....(9) *V. uguenensis*.

Stems and petioles glabrous:

Leaves usually 2–4-foliolate; leaflets elongate-oblanceolate, cuneate, up to 18 cm. long and 3 cm. broad; Madagascar (10) *V. densiflora*.

Leaves 1- or 3-foliolate; leaflets ovate to obovate up to 4 cm. long and 3 cm. broad:

Leaves 3-foliolate; leaflets obovate; panicles very short:

Gland-dots numerous and very conspicuous on the lower surface of leaflets; inflorescences axillary on the young branches; South Africa.....(11) *V. reflexa*.

Gland-dots inconspicuous on the under surface; inflorescences on the older growths; Portuguese East Africa.....(12) *V. Allenii*.

Leaves 1-foliolate:

Leaflets ovate, about 6 cm. long, with numerous prominent gland-dots; panicles long and drooping; East Africa .....(13) *V. eugeniifolia*.

Leaflets oblong or elliptic, up to 17 cm. long, gland-dots fine and not raised beneath; racemes more or less erect:

Petioles up to 3 cm. long; leaflets broadly elliptic and rather abruptly acuminate; East Africa (14) *V. ngamensis*.

Petioles short, about 1·2 cm. long; leaflets oblong-elliptic, gradually narrowing to the apex: Angola.....(15) *V. Gossweileri*.

(1) **V. schmidelioides** *Bkr.* in Journ. Linn. Soc. Bot. 20: 118 (1884).

Branches and petioles pilose; leaflets broadly elliptic, abruptly acuminate at the apex, cuneate at the base into a petiolule, 3–10 cm. long, 2–4 cm. broad, glabrous except on midrib. *Panicles* axillary; peduncles, pedicels and calyx softly pilose; calyx 4-lobed; petals 4. *Male flower*: stamens 8, 4 slightly shorter than the rest; rudimentary ovary with 4 styles. *Female flower* not seen. *Fruit* 4-celled, rough with raised glands.

MADAGASCAR. Central Madagascar, *Baron* 4336, 1282, 4308, 2212, 1102; *Bojer* 4 in Herb. Kew.

(2) **V. lanceolata** *G. Don* Gen. Syst. 1: 806 (1831). *Toddalia lanceolata* Lamk. Illustr. 2: 117 (1793). *V. querimbensis* Kl. in Peters Reise Mozamb. 87.

Branches and leaves glabrous; leaflets lanceolate to elliptic, narrowing gradually to the apex and base, sometimes rounded at apex and obovate, 4–10 cm. long and 1·2–3·5 cm. broad, strongly undulate on the margins. *Panicle* terminal, the branches subtrichotomous, puberulous to almost glabrous; flowers unisexual; calyx 4-lobed; petals 4. *Male flower*: stamens 8, with flattened

filaments, 4 very slightly shorter than the rest; rudimentary ovary with 4 styles. *Female flower*: staminodes obscure, ovary 4-8-lobed, 4-celled with 2 ovules in each cell; stigma sessile, peltate, 4-lobed. *Fruit* about the size of a pea, fleshy, 3–4-furrowed, 3–4-celled, with a single seed in each cell; embryo somewhat falcate, endosperm scanty; cotyledons oblong-linear, flat, obtuse, with a distinct constriction at the radicle; radicle shorter than cotyledons.

Widely distributed in South Africa from Knysna to the Kalahari, Portuguese East Africa, and in Mauritius and Reunion. The following specimens have been examined:—*Britten* 1979. *Balfour* (no number). *Bojer* (no number). *Bowie*. *Bowles* 46. *Burke* 77. *Burchell* 3125, 4670, 5489, 5285, 557A. *Borle* 592. *Commerson* (no number). *Davis* 103. *Dowling* 30. *Duthie* 28. *Ecklon* 1140. *Ecklon and Zeyher* 549, 949, 1140. *Flanagan* 121. *Fernando* in Herb. S. Afr. Forestry Department 1453. *Gerrard* 1784. *Hilner* 203. *Kirk* (no number). *Keet* in Herb. S. Afr. Forestry Department 3807. *Masson*. *McOwan* 147, 410. *Melliss* (no number). *Moggridge* 549. *Phillips* in Herb. S. Afr. Forestry Department 5500. *Paterson* 1911. *Pegler* 1287, 267. *Park* in Natal Govt. Herb. 2859. *Peters* (no number). *Rattray* 234. *Rudatis* 1492. *Rogers* 22473. *Sim* 2114. *Schlechter* 4710, 6234, 12008, 12164. *Wood* 150. *Zeyher* 350.

(3) **Vepris macrophylla** *Verdoorn*, comb. nov. *Toddalia macrophylla* Bkr. in Journ. Linn. Soc. Bot. 25: 303 (1889).

Leaves 3-foliolate on stout petioles; petioles 6–8 cm. long, rounded on the back and deeply grooved above; leaflets large and stout, obovate-elliptic, 13–16 cm. long, 6–8 cm. broad, petiolule 1–1·5 cm. long, grooved above. *Inflorescence* a terminal panicle. *Fruit* strongly 8-ridged, about 1·1 cm. in diameter.

MADAGASCAR. *Baron* 5488; Analamazaotra, *Thouvenot* 105.

(4) **Vepris Stolzii** *Verdoorn*, sp. nov.

Folia 3-foliolata, petiolo apice articulato, 2–5 cm. longo; *foliola* oblanceolata, 6–14 cm. longa, 2·3–4·5 cm. lata, acuminata, cuneata breviter petiolulata; *inflorescentia* axillaris, paniculata; *fructus* nitidus, 4-locularis.

Leaves 3-foliolate; petioles 2–5 cm. long, persistent, black; leaflets oblanceolate, 6–14 cm. long, 2·3–4·5 cm. broad, acuminate, cuneate into a short black petiolule, jointed to the apex of the petiole, deciduous. *Inflorescence* an axillary panicle. *Fruit* 4-celled, smooth, globose, black, about 6 mm. in diameter.

TROPICAL AFRICA. Tanganyika Territory: *Stolz* 2646.

(5) **Vepris nitida** *Verdoorn*, comb. nov. *Toddalia nitida* Bkr. in Journ. Linn. Soc. Bot. 25: 303 (1889).

Leaves 1-foliolate; leaflets jointed to the petiole, oblong-obovate, 10–14 cm. long, 3·5–6 cm. broad; petiole 1–1·5 cm.

long. *Fruit* somewhat pointed at the apex, 1·1 cm. long, 0·6 cm. in diameter, pitted; 4-celled with 1 seed in each cell.
MADAGASCAR. *Baron* 3184.

(6) **Vepris Elliotii** *Verdoorn*, comb. nov. *Toddalia Elliotii* Radlk. in Journ. Linn. Soc. Bot. 29: 9 (1891).

Unarmed, glabrous, the young branches subtriangular, gland-dotted. *Leaves* sparse, 1-foliolate; leaflets obovate or oblong-cuneate, 4–5 cm. long, 1·5 cm. wide, obtuse or emarginate, margins revolute, articulated to the petiole, gland-dotted. *Flowers* shortly pedicelled in axillary and terminal racemes or small racemose panicles; buds globose; calyx small, obscurely 4-lobed; petals 4; stamens 8; ovary rudimentary, 4-celled, pyramid-shaped with a large dorsal gland.
MADAGASCAR. Fort Dauphin, *Scott-Elliot* 3087. (I have not been able to trace this specimen.)

(7) **Vepris pilosa** *Verdoorn*, comb. nov. *Toddalia pilosa* Bkr. in Journ. Linn. Soc. Bot. 21: 329 (1886).

Branches densely pilose. *Leaves* 3-foliolate; petioles 1–2·5 cm. long, flattened and winged especially towards the apex, pilose; leaflets oblanceolate-oblong, rounded or retuse at the apex, cuneate at the base into a very short petiolule, 4–8·5 cm. long and 1·5–1·8 cm. broad, midrib pilose, otherwise glabrous. *Flowers* not seen. *Fruit* in almost sessile, axillary clusters, black, strongly pitted, about the size of a pea, with 8 very small persistent staminodes.
MADAGASCAR. *Baron* 3093.

(8) **V. zambesiaca** *S. Moore* in Journ. Bot. 57: 86 (1919).

Young flowering *branches* short, pubescent. *Leaves* 3-foliolate; petioles narrowly winged, 1–2 cm. long, pubescent; leaflets oblong-ovate, 2·5–3 cm. long, 1·2–1·7 cm. broad, ovate, rounded or retuse at the apex, slightly narrowed at the base, sessile, softly pubescent on both surfaces. *Panicles* axillary and terminal, pubescent, about 2–3 cm. long; flowers pedicelled; pedicels slender, pubescent; calyx cupular, pubescent; petals 4, glabrous, much longer than the calyx; stamens 6–7; rudimentary ovary with a long grooved style. *Female flower* not seen.
TROPICAL AFRICA. N. Rhodesia: Livingstone, North Bank of Zambesi, *Rogers* 7486.

(9) **V. uguenensis** *Engl.* Bot. Jahrb. 36: 243 (1905).

Young *branches* tomentose. *Leaves* 3-foliolate; petioles terete, about 1 cm. long, tomentose; leaflets narrowly oblong or oblanceolate-oblong, rounded or retuse at the apex, somewhat cuneate at the base, about 5 cm. long and 1–1·5 cm. broad, pubescent on the midrib and conspicuously gland-dotted beneath. *Male inflorescence* of short axillary cymes; calyx small, cupular, tomentose; petals 4, exceeding the calyx, slightly pubescent dorsally;

stamens 8, 4 long and 4 short; rudimentary pistil with two styles. *Female flower* not seen.
TROPICAL AFRICA. Tanganyika: Ugueno, *Engler* 1652.

(10) **Vepris densiflora** *Verdoorn*, comb. nov. *Toddalia densiflora* Bkr. in Journ. Linn. Soc. Bot. 25: 303 (1889).

Branches glabrous. *Leaves* 2–4-foliolate; petioles glabrous, flattened, 2·5–4·5 cm. long; leaflets elongate-oblanceolate, 10–18 cm. long, 2·5–3·5 cm. broad, broad and rounded at the apex, cuneate at the base into a short petiolule. *Inflorescence* a lateral panicle, but flowers not seen. *Fruit* glabrous, pitted, more or less globose, about 7 mm. in diam., 2-celled, with 1 seed in each cell.
MADAGASCAR. *Baron* 3053.

(11) **Vepris reflexa** *Verdoorn*, sp. nov.

Folia 3-foliolata, foliolis plerumque dependentibus oblanceolatis basi cuneatis apice rotundatis 3–8 cm. longis 1·2–3·2 cm. latis; *inflorescentia* axillaris, floribus plus minusve glomeratis, perianthio 4-mero, staminibus 8; *ovarium* 2-loculare, stigmate late peltato; *fructus* 1-locularis et 1-spermus, loculo uno abortivo, globosus, demum oblique oblongus, basi attenuatus, circiter 1·5 cm. longus.

Branches glabrous. *Leaves* 3-foliolate; petiole 0·5–1·5 cm. long, rounded and somewhat grooved above; leaflets usually drooping, obovate or oblanceolate, cuneate at the base, narrowing slightly to the rounded apex, 3–8 cm. long, 1·2–3·2 cm. broad, almost sessile to shortly petioluled. *Inflorescence* axillary, shorter or a little longer than the petiole; flowers more or less in glomerules, the lateral sessile; calyx small, cupular, 4-lobed, lobes ciliate; petals 4, exceeding the calyx. *Male flower*: stamens 8, 4 long and 4 short, filaments filiform; rudimentary ovary usually with 2 styles, glabrous. *Female flower*: staminodes 8; ovary 2-celled, with 2 ovules in each cell; stigma broadly peltate. *Fruit* globose, becoming oblong, oblique and narrowed at the base, about 1·5 cm. long, 1-celled, the other cell reduced to a slit in the wall of the fruit, 1-seeded. *Seed* with scanty endosperm and foliaceous cotyledons.
SOUTH AFRICA. Transvaal: Pretoria, Babiaanspoort, *Verdoorn* in National Herb. 2995 (Type); Barberton, *Rogers* in Herb. Kew. 21422, and in Transvaal Mus. 18798. Natal: *Gerrard* 1787; Mooi River, *Wood* 990, 4460 in Herb. Kew: Tugela, *Evans* 661.
TROPICAL AFRICA. S. Rhodesia: Matopo Hills, *Rogers* 5252.

(12) **Vepris Allenii** *Verdoorn*, sp. nov.

Folia 3-foliolata, foliolis obovatis apice rotundatis basi cuneatis 3·5–8 cm. longis 1·75–3·5 cm. latis inconspicue glandulosis; *inflorescentia* breviter paniculata; *flores* longe pedicellati, perianthio 4-mero, staminibus 8.

Branches glabrous. *Leaves* 3-foliolate; petioles 1–2 cm. long,

grooved above and sometimes flattened; leaflets obovate, rounded at the apex, cuneate at the base, 3·5–8 cm. long, 1·75–3·5 cm. broad, with a very short or rather long petiolule, gland-dots not conspicuous. *Inflorescence* of small panicles on the stems and axillary in upper leaves; flowers long-pedicelled; calyx very small, 4-lobed; petals 4, much longer than the calyx; stamens 8; filaments flattened, all about the same length; ovary rudimentary with a 2-lobed pointed style. *Female flower* not seen.
Tropical Africa. Portuguese East Africa, *Allen* 68.

(13) **Vepris eugeniifolia** *Verdoorn*, comb. nov. *Toddalia simplicifolia* var. *eugeniifolia* Engl. Pflanzenwelt Ost-Afrikas, C: 228 (1895).

Branches glabrous. *Leaves* 1-foliolate; petioles 1–1·5 cm. long, rounded and grooved above; leaflets usually drooping, ovate, cuneate at the base, apex obtuse, 3·5–7·5 cm. long, 2–3·5 cm. broad, with numerous raised gland-dots beneath. *Inflorescence* axillary, usually longer than the petioles, the flowers in glomerules along the long drooping peduncle; calyx small, cup-shaped, very shallowly 4-lobed; petals 4. *Male flower*: stamens 8, 4 long and 4 short; rudimentary ovary glabrous, with 2 styles. *Female flower* and *fruits* not seen.
Tropical Africa. Tanganyika Territory: Usambara, *Holst* 8869. Kenya Colony: Kibwezi, *Scheffler* 217.

(14) **Vepris ngamensis** *Verdoorn*, comb. nov. *Teclea ngamensis* Engl. mss.

Folia 1-foliolata, petiolo 2–3 cm. longo; *foliola* late elliptica, apice abrupte acuminata, basi cuneata, punctis glandulosis numerosis notata; *racemi* axillares; *flores* pedicellati, staminibus 7; *ovarium* rudimentarium hirsutum; *fructus* non visus.

Branches glabrous. *Leaves* 1-foliolate; petioles 2–3 cm. long, slender, grooved above; leaflets broadly elliptic, about 14 cm. long and 6 cm. broad, rather abruptly acuminate, cuneate at the base, very finely gland-dotted beneath. *Racemes* axillary, more or less erect; flowers pedicelled. *Male flower*: calyx small, cupular, 4-lobed; petals 4, exceeding the calyx; stamens 7, 3 long and 4 short, rudimentary ovary hairy. *Female flower* and *fruit* not seen.
Tropical Africa. Tanganyika Territory: Amani, *Engler* 565.

(15) **Vepris Gossweileri** *Verdoorn*, sp. nov.

Folia 1-foliolata, petiolo 1 cm. longo; *foliola* lanceolato- vel oblongo-elliptica, apice rotundata vel longe acuminata, basi cuneata, punctis glandulosis numerosis inconspicuis notata; *inflorescentia* axillaris, racemosa, glabra; *ovarium* 2-loculare.

Branches glabrous. *Leaves* 1-foliolate; petioles about 1 cm. long, grooved; leaflets lanceolate- to oblong-elliptic, 12–16 cm. long and 3–5 cm. broad, rounded at the apex or long-acuminate, cuneate at the base, finely gland-dotted beneath. *Racemes* axillary,

glabrous, erect; calyx small, cupular, 4-lobed; ovary 2-celled. *Male flower* not seen. *Fruit* 2-celled with one cell aborted.
West Africa. Angola: Loanda; Cazengo, *Gossweiler* 4895.

3. **Toddaliopsis** *Engl.* in Engl. & Prantl, Pflanzenf. 3, 4: 179 (1896).

Shrubs. *Leaves* 3-foliolate, pellucid-dotted. *Leaflets* oblanceolate or obovate. *Flowers* unisexual. *Stamens* twice as many as the petals. *Ovary* of 4 united carpels; cells 2-ovuled. *Fruit* 4-celled, strongly warted; cells 1-seeded; seed without endosperm.

T. sansibarensis *Engl.* in Engl. & Prantl, Pflanzenf. 3, 4: 179 (1896).

Shrubs. *Leaves* 3-foliolate, pellucid-dotted; leaflets oblanceolate or obovate, acuminate to a blunt apex, cuneate at the base, 4–10 cm. long, 1·3–3·7 cm. broad. *Flowers* unisexual; calyx 4-lobed; petals 4. *Male flower*: stamens 8 with threadlike filaments; ovary rudimentary. *Female flower*: staminodes 8; ovary of 4 united carpels, cells 2-ovuled. *Fruit* 4-celled, strongly warted, about 1·2 cm. in diameter; cells 1-seeded; seeds without endosperm.
Tropical Africa. Zanzibar, *Hildebrandt* 1292; *Kirk* 4170.

4. **Toddalia** *Juss.* Gen. 371 (1789).

Woody *scramblers*. *Branches* usually armed, glabrous or rusty-pubescent. *Leaves* 3-foliolate, gland-dotted; leaflets slightly crenulate at the margins. *Inflorescence* of axillary and terminal panicles or cymes, rusty-pubescent. *Flowers* unisexual, 5-merous; stamens as many as the petals. *Ovary* 5–7-celled, with 2 ovules in each cell. *Fruit* about the size of a pea; 3–7-celled, with 1 seed in each cell.—Africa and Asia.

T. asiatica *Lamk.* Illustr. 2: 116 (1793). *T. aculeata* Pers. Synop. 1249 (1805).

A *scrambling shrub* usually armed with prickles, young branches often with a rusty indumentum. *Leaves* 3-foliolate; petiole 1–3·5 cm. long, grooved above, sometimes becoming flattened and the edges of the groove forming wings, often armed with prickles; leaflets sessile, elliptic, obovate and oblanceolate, about 2–7 cm. long and 1·2–2·5 cm. broad, rounded or shortly acuminate at the apex, cuneate at the base, margin crenulate, midrib sometimes spinous. *Inflorescence* of axillary and terminal panicles or cymes, with a rusty indumentum; flowers pedicelled; calyx small, with 5 acute lobes, corolla much longer than the calyx, lobes 5, linear, somewhat hooded at the apex. *Male flowers*: stamens 5; rudimentary ovary glabrous, about 5-lobed with a long 5-ridged style. *Female flowers*: staminodes 5; ovary 5–7-lobed with a short stout style and a flattened shallowly 3–5-lobed stigma, 5–7-celled with 2 ovules in each cell. *Fruit* about the size of a pea, 3–7-celled with 1 seed in each cell, stigma persisting for some time.

South Africa. Transvaal: Zoutpansberg, *Pole Evans* in Govt. Herb. No. 17686; Spelonken, *Doidge* in Govt. Herb. 6585; Pietersburg, *Rogers* 18119; Sibasa, *Junod* in Trans. Mus. 21194. Tropical Africa. Rhodesia: Chipete Forest Patch, *Swynnerton* 213. Nyasaland: Shiré Highlands, *Buchanan* 171, 575; Namasi, *Cameron* (no number). Tanganyika: *Stolz* 2413; Usambara, *Buchwald* 317; *Scheffler* 716. Kenya: *Fries* 477A; Nairobi, *Dummer* 1609; Mororo, *Moon* 410; Moranga, *Volkens* 1698; Limuru, *Snowden* 633; without locality, *Thomas* 41. Uganda: *Snowden* 174; *Ussher* 37; *Fyffe* 8. Sudan: *Sillitoe* 282. Mascarene Islands. Mauritius: *Graham* (without no.); *Ayres* (without no.); *Bojer* (without no.). Bourbon: *Burchell* (without no.). Madagascar: *Baron* 5643, 1157, 2452, 1192, 1950, 1451, 3103, 3933, *Humblot* 2389.

Also in tropical Asia.

5. **Teclea** *Delile* in Ann. Sci. Nat. Ser. 2, 20: 90 (1843).

Unarmed *shrubs* or *trees*. *Leaves* 1–3-foliolate, pellucid-dotted. *Inflorescence* of terminal or axillary panicles or axillary racemes, cymes or spikes. *Flowers* polygamous. *Calyx* cup-shaped, 4–5-lobed, rarely 3-lobed. *Petals* 4–5. *Stamens* or *staminodes* as many as the petals. *Ovary* small and rudimentary with 1 style, in the female globose, with a broad peltate stigma, 1-celled with 2 ovules. *Fruit* fleshy, 1-celled and 1-seeded.—South and Tropical Africa, Comoro Islands and Madagascar.

Leaves 1-, 2- and 3-foliolate on the same plant, the leaflets usually drooping and folding along the midrib; whole plant glabrous; South Africa.....(1) *T. natalensis*.

Leaves constantly 3-foliolate, rarely reduced to 1 leaflet on the same plant but then leaflets not drooping and folding; stems, petioles or inflorescence often hairy:

Inflorescence composed of short axillary and sometimes terminal racemes or cymes; buds usually ellipsoid:

Stems and petioles very obviously pubescent; flowers sessile or subsessile:

Leaflets narrowing at the apex, glabrous except on the nerves; East Tropical Africa:

Petals setulose-pubescent; leaflets with entire margins.....(2) *T. trichocarpa*.

Petals glabrous; leaflets with obscurely crenulate margins.....(3) *T. Fischeri*.

Leaflets rounded at the apex, hairy on both surfaces, margins entire; petals glabrous; Belgian Congo. (4) *T. Engleriana*.

Stems and petioles glabrous or stems sometimes obscurely hairy; flowers usually pedicelled:

Leaflets oblanceolate, long-cuneate at the base, large, the middle one up to 17·5 cm. long, with finely and very obviously undulate margins; Comoro Islands. (5) *T. johannensis*.

Leaflets up to 12 cm. long with not very obviously and finely undulate margins:

Median leaflet appreciably larger than the lateral, abruptly acuminate:

Apices of leaflets shortly and bluntly acuminate; petiole winged; flowers few and lax; East Tropical Africa.....(6) *T. angustialata*.

Apices of the leaflets long-acuminate; petiole not winged; West Tropical Africa.....(7) *T. Afzelii*.

Leaflets almost of equal size, rounded or gradually acuminate:

Petiole grooved and flattened; leaflets sessile, finely dotted beneath; South Africa...(8) *T. Gerrardii*.

Petiole terete, faintly grooved; leaflets petioluled with large conspicuous dots beneath; Cameroons. (9) *T. campestris*.

Inflorescence of terminal or axillary panicles; buds small, globose:

Leaflets hairy on both surfaces:

Leaflets more or less rounded at the base; petioles obviously winged; East Africa.....(10) *T. glomerata*.

Leaflets cuneate at the base, petioles very narrowly winged; East Africa.....(11) *T. pilosa*.

Leaflets glabrous except sometimes on the midrib:

Leaflets at most obtusely pointed, scarcely acuminate, broadly obovate, emarginate; the margins crenate; East Tropical Africa.....(12) *T. crenulata*.

Leaflets distinctly acuminate, or if some rounded then oblanceolate: margins not crenate:

Inflorescence axillary; some flowers long-pedicelled; glands not raised on the upper surface of the leaflets; petioles grooved and more or less flattened; fruits ovate in outline, strongly pitted; West Tropical Africa.....(13) *T. grandifolia*.

Inflorescence terminal and axillary; flowers all sessile or subsessile; petiole subterete, obscurely grooved above; fruits not strongly pitted:

Leaflets oblong-elliptic, rather shortly narrowed at the base and somewhat acuminate at the apex; glands numerous and raised on the upper surface:

Fruit obliquely lanceolate; calyx not ciliolate; acumen of leaflets long and narrow, linear lanceolate; Cameroons.....(14) *T. Zenkeri*.

Fruit ellipsoid-ovoid; calyx evidently ciliolate; acumen of leaflets broad, narrowing to a blunt apex, ovate-lanceolate; Angola and Rhodesia. (15) *T. Welwitschii*.

Leaflets lanceolate, gradually narrowed to each end, glands rarely conspicuous on upper surface; fruits ellipsoid-globose; Rhodesia and throughout East Tropical Africa to Abyssinia.....(16) *T. nobilis*.

Leaves constantly 1-foliolate:

Flowers on long slender pedicels; leaflets broadly elliptic and abruptly acuminate into a short broad acumen: Tanganyika Territory.....(17) *T. amaniensis*.

Flowers sessile or subsessile; leaflets gradually acuminate or rounded at the apex:

Branches of the panicles long, weak and drooping; leaflets large, 12–17 cm. long, 4–6 cm. broad; Angola. (18) *T. Gossweileri*.

Branches of the panicles erect if somewhat long; leaflets about 5–12 cm. long:

Leaves long-acuminate, acute at the base, petioles rather slender; glands not visible on the lower surface; lateral nerves rather few and distinct from the secondary nerves; pulvinus with the joint about the middle; Comoro Islands.....(19) *T. unifoliolata*.

Leaves slightly acuminate, acute or subacute at the base; petioles rather short; glands numerous, large and very conspicuous on the lower surface; lateral nerves numerous and scarcely different from the secondary; pulvinus with the joint about the middle; Madagascar.....(20) *T. punctata*.

Leaves not acuminate, obtuse at the apex, acute at the base; petioles rather short; glands small and scarcely visible on the lower surface; lateral nerves numerous and not sharply distinguished from the secondary ones; pulvinus with the joint at the base; inflorescence mostly paniculate at the end of the branches; Tanganyika Territory.....(21) *T. simplicifolia*.

Leaves slightly acuminate, acute or rounded at the base; petioles short; glands small and inconspicuous, rather scattered; lateral nerves few and distinct from the secondary ones; pulvinus with the joint at the base; inflorescence axillary; Kenya Colony. (22) *T. viridis*.

(1) **T. natalensis** *Engl.* in Engl. & Prantl, Pflanzenf. 3, 4: 183 (1896). *Toddalia natalensis* Sond. in Harv. & Sond. Fl. Cap. 1 : 447 (1860).

A glabrous *shrub*. *Leaves* usually digitately 3-foliolate, sometimes 1-foliolate with a distinct joint between petiole and leaflet; petiole terete but grooved on the upper surface, 0·5–2·5 cm. long;

leaflets oblong-lanceolate, 4–10 cm. long and 1·5–4 cm. broad, narrowing somewhat to the blunt apex, cuneate at the base, usually dark green shining, drooping and folding along the midrib. *Inflorescence* of axillary racemes or sometimes panicles, rarely also terminal; flowers unisexual, sessile, usually grouped in threes; calyx small, cup-shaped, 4-lobed; petals 4, much longer than the calyx. *Male flower*: stamens 4; ovary small and rudimentary, glabrous. *Female flower*: staminodes 4, small; ovary black, glabrous, 1-celled; stigma peltate, style very short. *Fruit* 1-celled, 1-seeded.
South Africa. Albany Distr.: *Bowker* (without no.), *Bowie* (without no.); Keiskama Hoek, *Stayner* 97; Blaauw Kranz, *Burchell* 3663; Bathurst, *Tyson* 13385; East London, *Munro* P.S. 80. Komgha, *Flanagan* 881. Natal, *Saunders* (without no.).

(2) **T. trichocarpa** *Engl.* Pflanzenw. Ost-Afr. C: 433 (1895). *Toddalia trichocarpa* Engl. Pflanzenw. Ost-Afr. C: 228 (1895). *Teclea Stuhlmannii* Engl. Bot. Jahrb. 54: 308 (1917).

Tree, the young branches and petioles pubescent with spreading hairs. *Leaves* 3-foliolate; petioles 1·5–4·5 cm. long, flattened, sometimes narrowly winged, pubescent; leaflets obovate- to oblanceolate-elliptic, 3–9 cm. long, 1·5–3 cm. broad, narrowing somewhat to the blunt apex or rounded, cuneate at the base, sessile (at least the lateral), the median larger than the two lateral, glabrous except on the midrib. *Inflorescence* of short axillary racemes; flowers unisexual, clustered, subsessile; buds globose becoming ellipsoid; calyx small, cupular, 4-lobed, ciliate; petals 4, much longer than the calyx, setulose-pubescent outside; stamens 4; rudimentary ovary densely pilose. *Female flowers* not seen. *Fruit* ellipsoid, 1·2 cm. long and 0·7 cm. broad, hairy.
Tropical Africa. Tanganyika: Usarama; Kigani, *Stuhlmann* 6467 (incorrectly quoted as 6427 in Engler's description). Kenya: Nairobi, *Battiscombe* 72; *Linton* 212; Kikuyu Berge, *Stuhlmann* 937; Nieri-forest, *Fries* 246. Uganda: Toro, *Bagshawe* 1203.

(3) **T. Fischeri** *Engl.* Pflanzenw. Afr. 3, 1: 756 (1915). *Toddalia Fischeri* Engl. Pflanzenw. Ost-Afr. C: 228 (1895).

Stems, petioles and veins shortly pubescent; petioles channelled above, 0·5–1·5 cm. long; leaflets 2·5–4.5 cm. long, oblong-elliptic, narrowing towards the blunt apex, cuneate at the base, glabrous except on the midrib, margins somewhat crenate. *Inflorescence* of axillary racemes shorter than the leaves, pubescent; flowers unisexual, sessile; buds small, almost globose; calyx cupular, shortly 4-lobed; petals 4; stamens 4; rudimentary ovary small. *Female flower* and *fruit* not seen.
Tropical Africa. Tanganyika Territory; Salanda, *Fischer* 142.

(4) **T. Engleriana** *De Wild.* in Ann. Mus. Congo Ser. 4: 76 (1902).

Tree, young branches pubescent. *Leaves* 3-foliolate; petioles winged, about 2–4·5 cm. long, hairy on both surfaces; leaflets

obovate-elliptic, about 3–5·7 cm. long and 1·5–3 cm. broad, rounded at the apex or slightly acute but not acuminate, cuneate at the base, the lateral leaflets smaller than the terminal and somewhat oblique at the base, hairy on both surfaces. *Inflorescence* of lateral and terminal racemes, the lateral ones much shorter than the petiole. *Male flowers* not seen. *Female flowers* very shortly pedicelled or subsessile; calyx cupular, shortly 4-lobed; petals 4, glabrous; staminodes none; ovary ovoid; style short with a large rounded stigma.
Tropical Africa. Belgian Congo: Lukafu, *Verdick* 142.

(5) **Teclea johannensis** *Verdoorn*, sp. nov.

Rami glabri; *folia* 3-foliolata; *foliola* oblanceolata, 9–17·5 cm. longa, basi longe cuneata, glabra, marginibus crebre undulatis; *racemi* breves, axillares, pubescentes; *flores* unisexuales, 4-meri, pedicellis longis; *alabastra* ellipsoidea; *ovarium* globosum, parce pilosum, 1-loculare, stylo crasso, stigmate late peltato.

Stems and *petioles* glabrous. *Leaves* 3-foliolate; petioles 2–4·5 cm. long, broadly channelled above; leaflets sessile, oblanceolate, 9–17·5 cm. long, narrowing somewhat towards the rounded apex and long-cuneate at the base, the lateral with the outer margins somewhat rounded, glabrous, the margins finely undulate. *Inflorescence* of short axillary pubescent racemes ; flowers unisexual, long-pedicelled; buds ellipsoid; calyx small, 4-lobed; petals 4, much longer than the calyx; staminodes 4, small; ovary globose, thinly pilose, 1-celled; style evident, stout; stigma broadly peltate. *Male flower* and *fruit* not seen.
Mascarene Islands. Comoro Islands: Johanna, *Hildebrandt* 1668.

(6) **T. angustialata** *Engl.* Bot. Jahrb. 36: 245 (1905).

Stem and *petioles* glabrous. *Petioles* 1·5–3·5 cm. long, narrowly winged, wings broadening towards the apex; leaflets obovate, narrowed at the apex into a very short, broad, blunt acumen, shortly cuneate at the base, 5–10 cm. long, 2–4·5 cm. broad, the lateral appreciably smaller than the median, glabrous, the margins very slightly undulate. *Inflorescence* of short axillary pubescent racemes; flowers unisexual, pedicellate; buds ellipsoid; calyx small, 4-lobed; petals 4, much longer than the calyx; stamens 4; rudimentary ovary small with a straight style, pilose. *Female flower* and *fruit* not seen.
Tropical Africa. Tanganyika Territory: Usambara; Derema, *Scheffler* 129. Uganda: Toro, *Bagshawe* 1206.

(7) **T. Afzelii** *Engl.* Bot. Jahrb. 23: 153 (1897).

Stem and *petioles* glabrous. *Petioles* 1·5–2·5 cm. long, semiterete, grooved above; leaflets up to 12 cm. long and 3 cm. broad, oblanceolate, cuneate at the base into a petiolule and long-acuminate at the apex, glabrous, lateral nerves numerous and close together, lower surface gland-dotted. *Inflorescence* of short axillary racemes;

flowers not seen. *Fruit* pedicelled, obovate in outline, 1·5 cm. long and 0·8 cm. broad, apex oblique, 1-celled and 1-ovuled.
TROPICAL AFRICA. Sierra Leone: without locality, *Afzelius*.

(8) **Teclea Gerrardii** *Verdoorn*, sp. nov.

Rami glabri vel apices versus parce pubescentes; *foliola* oblanceolato-elliptica; *inflorescentia* racemoso-cymosa, axillaris, brevis, pubescens; *flores* unisexuales, pedicellati, 4-meri; *alabastra* ellipsoidea; *stamina* petala aequantia; *ovarium* pilosum, 1-loculare, ovulis 2, stylo breve, stigmate late peltato; *fructus* 1·5 cm. longus, 1 cm. latus, pilosus, monospermus.

Stem and *petioles* glabrous, sometimes obscurely hairy near the apex or in the groove of the petiole. *Petioles* 1–2·5 cm. long, broadly grooved, sometimes flattened and slightly winged, rarely somewhat pilose at the apex; leaflets oblanceolate- to obovate-elliptic, 4–9 cm. long, 1·5–3 cm. broad, narrowing slightly to the rounded apex, cuneate at the base. *Inflorescence* of short axillary cymose racemes, pubescent; flowers unisexual, pedicelled; buds ellipsoid; calyx small, 4-lobed; petals 4, much longer than the calyx. *Male flower*: stamens 4; ovary rudimentary, pilose. *Female flower*: staminodes 4; ovary globose, pilose, 1-celled, with 2 ovules; style short but evident; stigma broadly peltate. *Fruit* 1·5 cm. long, 1 cm. broad, thinly pilose, 1-seeded.
SOUTH AFRICA. Natal; *Gerrard* 1514 (Type), *Sanderson* 921. *Saunders* 1881, *Oliver* 4. Lusikisiki, *Miller* in For. Dept. Herb. 5172 and 4407.

(9) **T. campestris** *Engl.* Bot. Jahrb. 54: 307 (1917).

Stems and *petioles* glabrous. *Petioles* 1·5–3 cm. long, terete, faintly grooved above; leaflets oblanceolate-elliptic, about 9 cm. long and 2 cm. broad, cuneate at the base into a distinct petiolule, gradually acuminate to a blunt apex, the lower surface dotted with large conspicuous gland-dots. *Inflorescence* an axillary raceme. *Flowers* very young. *Fruit* not seen.
TROPICAL AFRICA. North Cameroons: Kalgey, *Ledermann* 5184.

(10) **Teclea glomerata** *Verdoorn*, comb. nov. *Toddalia glomerata* F. Hoffm. Beitr. Kenntn. Flora von Central Ost-Afr. 18 (1889). *Vepris glomerata* Engl. in Engl. & Prantl, Pflanzenf. 3, 4: 178 (1896).

Stems glabrous, but tips of young branches white-tomentose. *Petioles* 2–4·5 cm. long, flattened and winged, the wing broadening towards the apex, tomentose; leaflets ovate or obovate-oblong, rounded or slightly narrowing towards the blunt apex, broadly cuneate or rounded at the base, 2·5–5·5 cm. long, 1–2 cm. broad, sessile, margin entire, softly white-pubescent. *Panicles* glomerate, sessile, terminal on shortened lateral branches, tomentose; flowers unisexual, sessile, very small, globose; calyx 4-toothed; corolla closed; stamens 4–5.
TROPICAL AFRICA. Nyasaland: Kakoma, *Bohm-Reichard* 3A.

(11) **Teclea pilosa** *Verdoorn*, comb. nov. *Toddalia pilosa* Engl. Pflanzenw. Ost-Afr. C: 228 (1895), non Baker. *Vepris pilosa* Engl. Pflanzenw. Afrikas 3, 1: 754 (1915).

Stems softly pubescent. *Petioles* 1–2 cm. long, flattened and very narrowly winged, pubescent; leaflets obovate-oblong, rounded at the apex or broadly acuminate, narrowly cuneate at the base, 2–5 cm. long, 1–2·5 cm. broad, sessile or subsessile, softly pubescent, margin obscurely crenate. *Inflorescence* a panicle; calyx glabrous, cupular, obscurely 4-lobed; petals oblong. *Fruit* ellipsoid-globose, 7 mm. long and 5 mm. broad, glabrescent, brown.
Tropical Africa. Kenya Colony: Kibwesi, *Scheffler* 107.

(12) **T. crenulata** *Engl.* in Pflanzenw. Ost-Afr. C: 433 (1895). *Toddalia crenulata* Engl. in Pflanzenw. Ost-Afr. C: 228 (1895).

Stem shortly pubescent. *Petioles* about 2–3 cm. long, over half as long as the lateral leaflets, flattened, narrowly winged and shortly pubescent; leaflets obovate-oblong, the middle one larger than the lateral, cuneate at the base, rounded and retuse at the apex, sessile, margin crenulate, glabrous except on the midrib. *Panicles* terminal, pubescent; flowers not seen. *Fruit* ellipsoid, about 1·2 cm. long and 0·8 cm. broad, fleshy, 1-celled.
Tropical Africa. Portuguese East Africa: Pugurimi, Quilimane, *Stuhlmann* in Mus. Bot. Hamburg 562.

(13) **T. grandifolia** *Engl.* Bot. Jahrb. 23: 153 (1897).

Stem and *petioles* glabrous. *Petioles* 2–4·5 cm. long, grooved above and often flattened; leaflets elliptic-oblong, narrowing towards the apex and abruptly acuminate into a long narrow acumen, cuneate at the base, 7–19 cm. long, 2·5–7 cm. broad, rather papery, glabrous, lateral nerves prominent beneath, about 1 cm. or more apart. *Inflorescence* of axillary panicles, pubescent; flowers unisexual; buds globose; calyx cupular, 4-lobed; petals 4. *Male flower*: stamens 4. *Female flower*: ovary globose, glabrous or thinly pilose, 1-celled; style evident, stigma large, flattened, peltate.
Tropical Africa. Cameroons: Johann-Albrechtshöhe, *Staudt* 472, 493: S. E. Kunde, *Mildbraed* 9234. Sierra Leone: Sugar Loaf Mt., *Barter* (without no.).

(14) **T. Zenkeri** *Engl.* Bot. Jahrb. 32: 120 (1903).

Stem and *petioles* glabrous. *Petioles* 3–4 cm. long, subterete; leaflets elliptic-oblong, 10–16 cm. long, 3·5–5·5 cm. broad, abruptly acuminate at the apex into a long narrow acumen, cuneate at the base into a petiolule, glabrous, a few glands sometimes evident or raised above. *Panicles* terminal and axillary in the upper leaves, branching, pubescent; flowers unisexual. *Male flowers* small, clustered, sessile; buds globose; calyx 4-lobed; petals 4; stamens 4; ovary rudimentary. *Female flower* not seen. *Fruit* narrowing and curving towards the apex, about 1·2 cm. long, 0·5 cm. broad.

Tropical Africa. Cameroons: Sanaga, *Zenker* 1455; Johann-Albrechtshöhe, *Staudt* 590.

(15) **Teclea Welwitschii** *Verdoorn*, comb. nov. *Zanthoxylon Welwitschii* Hiern in Cat. Afr. Pl. Welw. 1: 114 (1896).

Stems glabrous. *Leaves* 3-foliolate; petioles terete, very slightly grooved above near the apex, 2–5 cm. long, glabrous; leaflets elliptic-oblong, broadly acuminate, cuneate at the base into a long or short petiolule, 7–20 cm. long, 2–7 cm. broad, glabrous, the glands numerous and raised on the upper surface. *Inflorescence* axillary and terminal; peduncle stout and usually elongating, not much branched; flowers glomerate, polygamous, sessile; buds globose; calyx cup-shaped, shallowly 4-lobed, ciliate; petals 4; stamens 4; ovary globose, glabrous, with a short style and peltate stigma, 1-celled. *Fruit* small, ovoid, 0·7 cm. long and 0·5 cm. broad.

Tropical Africa. Rhodesia: Chimanimani Mts., *Swynnerton* 1322. Angola: Golungo Alto; Serra de Alto Queta, *Welwitsch* 4554, 4555 and 4556; Cazenga, *Gossweiler* 4799, 5344; Granja Dist., *Gossweiler* 5229, 5767, 6329.

(16) **T. nobilis** *Delile* in Ann. Sci. Nat. Ser. 2, 20: 90 (1884). *Toddalia nobilis* Hook. f. in Oliv. Fl. Trop. Afr. i: 306 (1868).

Stems glabrous or sometimes shortly pubescent. *Leaves* 3-foliolate; petioles subterete, scarcely grooved above, 2–5 cm. long, usually glabrous; leaflets elliptic-lanceolate, 7–18 cm. long, 2–4·5 cm. broad, narrowing towards the rounded or acute apex, cuneate at the base into a petiolule, glabrous, dull green, rather leathery, glands very seldom evident on the upper surface. *Panicles* axillary and terminal, branching, pubescent or glabrescent; flowers polygamous, sessile; buds globose; calyx 4-lobed or toothed, petals 4; stamens or staminodes 4; ovary rudimentary, glabrous; pointed, or in female flowers sub-globose, glabrous with a short style and flattened peltate stigma, 1-celled. *Fruit* ovoid, 7 cm. long and 5 cm. broad, 1-celled and 1-seeded.

Tropical Africa. Rhodesia: Chirinda, *Swynnerton* 2163. Nyasaland: no locality, *Buchanan* 892. Tanganyika: Kyimbila District, *Stolz* 1586. Kenya Colony: Eldama, *Whyte* (without no.); no locality, *Elliot* 377 and 247. Uganda: Entebbe, *Dawe* 7 and 479; Kipaya, *Dummer* 496; no locality, *Dummer* 298; Toro, *Bagshawe* 1200, 1153, 1084; Malema, *Bagshawe* 250; Chusazi, *Bagshawe* 110; Mabira, *Ussher* 43 and 90; Lugamba, *Scott-Elliot* 7140. Abyssinia: Wogera, *Schimper* 1293; Insaba, *Beccari* 58. Eritrea: Hamasen, *Pappi* 271; Acrour, *Schweinfurth and Riva* 729 and 113. Sudan: Dukuttu, *Schweinfurth* 2734; Missu, *Schweinfurth* 2786.

(17) **T. amaniensis** *Engl.* Bot. Jahrb. 36: 244 (1905).

Stem glabrous. *Leaves* 1-foliolate; petioles 1–3 cm. long, terete, pulvinate, jointed and knee-bent at the apex; leaflet broadly elliptic, about 15 cm. long and 7 cm. broad, abruptly

narrowed into a short broad acumen, shortly cuneate; glands not evident on upper surface but finely dotted on the lower; lateral nerves distinct from the secondary on the lower surface, about 10 on each side of the midrib. *Male flowers* on long slender pedicels and arranged in loose panicles; calyx small, cupular, 4-lobed; petals 4, longer than the calyx; stamens 4; rudimentary ovary hairy. *Female flowers* and *fruit* not seen.
Tropical Africa. Tanganyika Territory: Amani, *Warnecke* in Herb. Amani 516k.

(18) **Teclea Gossweileri** *Verdoorn*, sp. nov.

Folia 1-foliolata, petiolis 1·5–3·5 cm. longis; *foliola* oblongo-elliptica, apice acuminata, basi cuneata, punctis glandulosis numerosis inconspicuis notata; *inflorescentia* axillaris; *pedunculi* longi; *flores* glomerati, sessiles; *stamina* 4.

Stem glabrous. *Leaves* 1-foliolate; petioles 1·5–3·5 cm. long, strongly grooved and somewhat flattened, slightly pulvinate and jointed at the apex; leaflet oblong-elliptic, about 14 cm. long and 5 cm. broad, rather acuminate at the apex and cuneate at the base, gland-dots numerous and fine but not very evident; lateral nerves numerous and not very distinct from the secondary. *Male flowers* sessile and clustered on long weak axillary peduncles; calyx and corolla small; stamens 4; rudimentary ovary small, glabrous. *Female flower* and *fruit* not seen.
West Africa. Angola; *Gossweiler* 8328.

(19) **T. unifoliolata** *Baill.* in Bull. Soc. Linn. Paris i: 591 (1886). *Comoroa pisocarpa* Oliv. in Hook. Ic. Pl. t. 2408 (1895).

Stems glabrous. *Leaves* 1-foliolate; petioles fairly slender, about 1·5 cm. long, pulvinate at the apex, jointed in the middle of the pulvinus. Leaflet oblong-lanceolate, fairly long-acuminate at the apex, cuneate at the base, about 12 cm. long and 4 cm. broad, glabrous, lateral nerves rather few and distinct from the secondary nerves, glands not visible on the lower surface. *Inflorescence* of axillary spikes or racemes; flowers unisexual; buds ellipsoid; calyx 4-lobed; petals 4, much longer than the calyx; stamens 4; rudimentary ovary small, glabrous, conical. *Female flower* not seen. *Fruit* subglobose, 1-seeded, about 5 mm. in diam.
Mascarene Islands: Comoro; *Humblot* 364, 1324. Great Comoro, *Kirk*.

(20) **Teclea punctata** *Verdoorn*, sp. nov.

Folia 1-foliolata, petiolo apice pulvinato circiter medium pulvini articulato; *foliola* ovata vel obovato-oblonga, apice rotundata vel brevissime et sensim acuminata, basi late cuneata, punctis glandulosis magnis et conspicuis notata, nervis lateralibus numerosis; *inflorescentia* axillaris et terminalis, spicata vel spicato-paniculata, breviter pubescens.

Stems glabrous. *Leaves* 1-foliolate; petioles short, about 1 cm. long, somewhat flattened, pulvinate at the apex, jointed in the

middle of the pulvinus; leaflet ovate or obovate-oblong, rounde or very shortly and gradually acuminate at the apex, broadl cuneate at the base, about 8 cm. long, 3 cm. broad, glabrous lateral nerves numerous and scarcely different from the secondary glands numerous, large and very conspicuous on the lower surface *Inflorescence* of axillary and terminal simple or branched spikes shortly pubescent; calyx 4-toothed or lobed; petals 4, muc longer than the calyx; stamens 4; ovary rudimentary. *Fema flower* and *fruit* not seen.
MADAGASCAR. *Scott-Elliot* 3031.

(21) **Teclea simplicifolia** *Verdoorn*, comb. nov. *Toddalia simplic folia* Engl. Pflanzenw. Ost-Afr. C: 228 (1895).

Stems glabrous. *Leaves* 1-foliolate, jointed almost at the bas of the pulvinus; petiole short, fairly stout, 0·5-1 cm. long; leafle ovate or obovate-oblong, rounded at the apex or sometimes slightl narrowing, cuneate at the base, 4–10 cm. long, 2–5 cm. broad glabrous, lateral nerves numerous and not sharply distinguishe from the secondary ones, glands small and scattered on the lowe surface. *Inflorescence* usually paniculate at the ends of the branch lets, shortly pubescent; flowers unisexual, subsessile; calyx cup shaped, 4-toothed or lobed; petals 4, much longer than the calyx stamens 4; rudimentary ovary small and conical. *Female flower* and *fruit* not seen.
TROPICAL AFRICA. Tanganyika Territory: Elancirob-Krate *Jaeger* 510; Marangu, *Volkens* 1709A; Usambara District, *Hol* 3801.

(22) **Teclea viridis** *Verdoorn*, sp. nov.

Folia 1-foliolata, petiolo apice pulvinato circiter basi pulvi articulato; *foliola* ovato-oblonga, apice rotundata vel leviter angu tata, basi cuneata, glabra, punctis glandulosis parvis et incon spicuis laxe dispositis notata, nervis lateralibus paucis; *inflore centia* axillaris, spicata vel subracemosa, pubescens.

Stems glabrous. *Leaves* 1-foliolate; petiole short, stout, 0·5- cm. long, pulvinate at the apex and jointed more or less at the bas of the pulvinus; *leaflet* ovate-oblong, rounded or slightly narrow ing towards the apex, cuneate at the base, 5–12 cm. long, 2–4·5 cm broad, glabrous, lateral nerves on the under surface few and di tinct from the secondary, glands small, inconspicuous, rath scattered. *Inflorescence* of 1 or more axillary spikes or raceme pubescent; flowers unisexual; calyx cupular, 4-toothed or lobed petals 4, much longer than the calyx. *Male flower*: stamens 4 ovary rudimentary. *Female flower*: staminodes 4; ovary globos with a broad sessile peltate stigma. *Fruit* globose, about 0·7 cm in diameter, smooth.
TROPICAL AFRICA. Kenya Colony: Nairobi, *Dawson* 387, *Battis combe* 933 and 867 (Type); Kerura, *Battiscombe* 937; Mt. Keni *Fries* 1100A. No locality, *Elliot* 282 and 155.

6. **Diphasia** *Pierre* in Bull. Soc. Linn. Par. n. ser., 70 (1898).

Small *trees*, unarmed. *Leaves* digitately 3-foliolate, glandular-punctate. *Inflorescence* of terminal and axillary panicles. *Flowers* polygamous. *Calyx* with 4 shallow rounded lobes. *Petals* 4. *Stamens* 4. *Disc* with long stiff yellow hairs. *Ovary* glabrous or sparingly hispid, formed of 2 carpels united entirely and with a very short style and peltate stigma. *Ovules* 2. *Fruit* 2-lobed or of 1 oblique carpel, the other carpel aborting and forming a lobe at the base, about 1 cm. long. *Seed* solitary in each carpel.—West Tropical Africa.

Diphasia angolensis *Verdoorn*, comb. nov. *Cranzia angolensis* Hiern Cat. Afr. Pl. Welw. 1: 115 (1896). *Diphasia Klaineana* Pierre in Bull. Soc. Linn. Par. n. ser., 68 (1898).

A small *tree*, unarmed, young branches hispid with yellow or gray hairs. *Leaves* 3-foliolate; petiole hispid-tomentose, 2–8 cm. long, usually somewhat flattened; leaflets elliptic-obovate, acuminate at the apex, cuneate at the base into a petiolule, 5–18 cm. long, 2.3–7 cm. broad, glabrous above except on the midrib and sparingly hairy beneath, margin entire; petiolule hispid, 2–10 mm. long. *Inflorescence* of terminal and axillary panicles; peduncles yellow-hispid-tomentose, flattened; calyx 4-lobed, lobes shallow and rounded; petals 4, much longer than the calyx; stamens 4; disc annular, hispid with long yellow hairs; ovary glabrous or sparingly hispid, formed of 2 entirely united carpels ending in a single short style and a peltate stigma; ovules 2 in each carpel. *Fruit* about 1 cm. long, brownish, glabrous or sparingly hairy, covered with raised dots, 2-lobed or of one oblique carpel, the other aborting and forming a swelling at the base of the fruit. Tropical Africa. Gabon: *Klaine* 2592, 753, 3221, 3190. Angola: Golungo Alto, *Welwitsch* 4552, 4553.—*Dummer* 722 from Uganda may belong here. The flowers, which are rather young, are subsessile instead of pedicelled as in the above.

7. **Oricia** *Pierre* in Bull. Soc. Linn. Paris 2: 1288 (1897).

Trees. *Leaves* digitately 3–5-foliolate, gland-dotted, often very large. *Inflorescence* of axillary and terminal racemes or panicles, the subtending leaves in some species very much reduced; peduncles flattened and tomentose. *Flowers* polygamous. *Calyx* 4-lobed. *Petals* 4, much longer than the calyx. *Stamens* or staminodes 4. *Ovary* hispid, of 2–4 carpels somewhat cohering at the base, otherwise free; styles very short, sometimes cohering, ending in a fused peltate stigma; stigma obscurely 2–4-lobed; ovules 2 in each carpel. *Fruit* of 2–4 distinct carpels 1–3 of which are often aborted but persistent. *Seed* 1 in each carpel, without endosperm.—West Tropical Africa, Rhodesia to South Africa.

Carpels 4; lateral nerves on lower surface of the leaflets distinct from the secondary, about 6–20 on each side of the midrib:

Leaflets 5; Congo.....(1) *O. Lecomteana*.

Leaflets 3:

Inflorescence of axillary racemes; leaflets subsilvery be
neath; West Tropical Africa.....(2) *O. Klaineana*
Inflorescence of terminal and axillary panicles; leaflets no
subsilvery beneath:
Branches and inflorescence woolly-tomentose; leaves a
the base of the panicles much reduced, simple an
densely tomentose; calyx enlarging and persisting i
fruit; West Tropical Africa.....(3) *O. gabonensis*
Branches and inflorescence shortly pubescent; leaves no
reduced; calyx not enlarging; leaflets about 7–14 cm
long; West Tropical Africa.....(4) *O. suaveolens*
Branches and inflorescence at most finely puberulous; leave
not reduced; calyx probably not enlarging; leaflet
about 18–20 cm. long; Cameroons...(5) *O. trifoliolata*
Carpels 2; lateral nerves numerous and close together:
Leaflets ovate or oblong-ovate, 7–15 cm. long, 3–7 cm. broad
pedicels glabrescent, long; Rhodesia.....(6) *O. Swynnertonii*
Leaflets narrowly obovate, oblanceolate or elliptic, 6–10 cm
long, 2–3·5 cm. broad; pedicels hairy, short; South Africa
Rudimentary ovary densely tomentose...(7) *O. transvaalensis*
Rudimentary ovary thinly hairy.....(8) *O. Bachmannii*

(1) **O. Lecomteana** *Pierre* in Bull. Soc. Linn. Paris, 2: 128
(1897).

Branches and petioles pubescent; leaflets 5, almost sessile obovate, the lateral ones lanceolate and acute, slightly undulate at length almost glabrous, when young puberulous along the mid rib, submembranous, 16–24 cm. long, 7–10 cm. broad, longer tha the petiole, lateral nerves 12–14 pairs 1·3–2·4 cm. apart, some what raised below. Fruiting *racemes* 4–5 cm. long; branches very short and pilose. *Carpels* 1–4, obtuse, pilose, 1·4 cm. long 7–8 mm. broad, glandular-punctate, 1-seeded; seed withou endosperm.

Tropical Africa. Belgian Congo: Niunvoux, *Lecomte* (n. 68).– Not seen by me.

(2) **O. Klaineana** *Pierre* in Bull. Soc. Linn. Paris, n. s. 68 (1898)

A small *tree*, branches and petioles pubescent. *Leaves* 3-folio late; petioles 3–18 cm. long, terete; leaflets obovate, 7–21 cm (rarely to 24 cm.) long, 4–10 cm. broad, shortly acuminate at th apex, bright and subsilvery beneath, lateral nerves about 12–2 on each side. *Racemes* axillary, mostly simple, tomentose, 3–6 cm long; calyx pubescent, with 4 acuminate sepals; petals 4·5 mm long, boat-shaped, pubescent; stamens in the female flower 1 mm long with an oval acuminate anther; carpels entirely free, bu stigmas fused, sessile, peltate, and 4-lobed.

Tropical Africa. Gabon: Libreville, *Klaine* 1303.

(3) **O. gabonensis** *Pierre* in Bull. Soc. Linn. Paris, 2: 1289 (1897)

Branches and petioles pubescent. *Leaves* 3-foliolate; petiole 3–16 cm. long, terete; leaflets broadly obovate, 10–23 cm. long

5–11 cm. broad, shortly acuminate at the apex and cuneate at the base, glabrous or young leaflets pubescent on the nerves; lateral nerves prominent beneath, 10–15 on each side, 1–2 cm. apart. *Inflorescence* of axillary or terminal racemes or panicles, the subtending leaf often much reduced and densely pubescent; flowers on pubescent pedicels; calyx 4-lobed, tomentose, small; petals 4, much longer than the calyx; stamens 4, about as long as the petals, in female flowers sterile or sometimes reduced; filaments flattened; ovary tomentose, of 4 carpels somewhat cohering but separable, with a common peltate 4-lobed style; in male flowers carpels 4, abortive, with 4 free styles. *Fruit* of 4 free carpels, 1 or 3 rudimentary but persistent, tomentose, obliquely obovate, with 4 enlarged reflexed calyx-lobes persisting for some time; seed 1 in each carpel, without endosperm.

TROPICAL AFRICA. Gabon: Libreville, *Klaine* 444, 3206. Cameroons: *Zenker* 777.

4) **Oricia suaveolens** *Verdoorn*, comb. nov. *Teclea suaveolens* Engl. Bot. Jahrb. 23: 152 (1897). *Oricia leonensis* Engl. Bot. Jahrb. 32: 120 (1903).

Branches and petioles pubescent. *Leaves* 3-foliolate; petioles 2–3·5 cm. long, terete and grooved above; leaflets broadly obovate-oblong, 6–14 cm. long and 2·5–8 cm. broad, the median appreciably larger than the lateral, rounded or slightly acuminate and retuse at the apex, cuneate at the base, the lateral somewhat oblique; lateral nerves distinct from the secondary, about 6 on each side of the midrib; midrib pubescent on the upper surface. *Inflorescence* of terminal panicles; peduncles pubescent; flowers sessile or subsessile, small, glabrous; calyx cupular, shortly 4-lobed; petals 4. *Male flower*: stamens 4; rudimentary ovary very small and densely covered with long shaggy hairs. *Female flower* not seen. *Fruit* of 2 free carpels with 1–2 rudimentary, persistent carpels at the base, pubescent especially at the base.

TROPICAL AFRICA. Sierra Leone: *Afzelius*, *Vohsen*; Sugar Loaf Mt., *Dalziel* 977. French Guinea: Kindia, *Chevalier* 13100.

5) **Oricia trifoliolata** *Verdoorn*, comb. nov. *Araliopsis trifoliolata* Engl. Bot. Jahrb. 54: 304 (1917).

Branches and petioles puberulous. *Leaves* 3-foliolate; petioles 5–16 cm. long, somewhat compressed; leaflets elongate-oblong, 14–23 cm. long, about 7 cm. broad, shortly acuminate, cuneate at the base, lateral nerves distinct from the secondary and over 1 cm. apart. *Panicles* terminal and axillary, puberulous. *Female flower*: calyx small, cupular, 4-lobed; petals 4, much longer than the calyx, 2·5 mm. long, puberulous outside; staminodes 4; ovary of 4 carpels, separable but cohering, hairy all round. *Male flower* and *fruits* not seen.

TROPICAL AFRICA. Cameroons: Victoria, *Zahn* 499.

6) **Oricia Swynnertonii** *Verdoorn*, comb. nov. *Teclea Swynnertonii* Bkr. f. in Journ. Linn. Soc. 40: 35, pl. 2, figs. 1–5 (1911).

Medium-sized *tree*; young branches and petioles fusco-pubescent. *Leaves* 3-foliolate; petioles 2–7 cm. long, subterete, fusco-pubescent; leaflets ovate or oblong-ovate, 7–15 cm. long, 3–7 cm. broad, broadly attenuated to the blunt apex, cuneate at the base into a petiolule, coriaceous; lateral nerves numerous, close together, glabrous except sometimes on the midrib; petiolule 0·5–1 cm. long. *Inflorescence* of axillary and terminal racemes and panicles, the flowers subglomerate, unisexual; peduncles flattened, tomentose; pedicels terete, glabrescent, usually longer than the flower; calyx small with 4 shallow, ciliate lobes; petals 4, much longer than the calyx. *Male flower*: stamens 4, as long as the petals, becoming much longer; filaments flattened; rudimentary ovary of 2 small carpels, long-hispid at the base, sometimes fused. *Female flower*: staminodes 4, small; ovary of 2 carpels close together and cohering at the base but growing quite apart with age; styles usually separate, very short; stigma fused, peltate, obscurely 2-lobed. *Fruit* fleshy, one carpel usually aborted but persistent; seed 1 in each carpel.

TROPICAL AFRICA. Rhodesia: Chirinda Forest, *Swynnerton* 12. Nyasaland: *Buchanan* 758.

(7) **Oricia transvaalensis** *Verdoorn*, sp. nov.

Arbor; *ramuli* petiolique pubescentes; *folia* 3-foliolata; *foliola* obovata vel oblanceolato-elliptica, apicem versus late acuminata, basi in petiolulum cuneata, costis exceptis glabra; nervi laterales numerosi; *inflorescentia* racemosa vel paniculata, axillaris et terminalis; *flores* unisexuales, subglomerati, 4-meri; *pedunculi* compressi, tomentosi; *pedicelli* breves, pubescentes; *ovarium* rudimentarium 2-merum, dense hispidum, tomentosum.

Tree: branches and petioles pubescent. *Leaves* 3-foliolate; petioles 1·5–6 cm. long, subterete, grooved above, pubescent; leaflets obovate or oblanceolate-elliptic, 6–10 cm. long, broadly acuminate at the apex, cuneate at the base into a petiolule, glabrous except on the midrib, lateral nerves numerous and close together; petiolule about 0·5 cm. long. *Inflorescence* of axillary and terminal racemes or panicles; flowers unisexual, subglomerate; peduncles flattened, tomentose; pedicels short, up to about as long as the flowers, hairy; calyx small, 4-lobed, hairy; petals 4, much longer than the calyx. *Male flower*: stamens 4, about as long as the petals, becoming longer; rudimentary ovary of 2 small carpels usually fused and densely hispid-tomentose. *Female flower* and *fruit* not seen.

SOUTH AFRICA. Transvaal: Potato Bosch, *Burtt Davy* 1163.

(8) **Oricia Bachmannii** *Verdoorn*, comb. nov. *Teclea Bachmannii* Engl. Bot. Jahrb. 23: 153 (1897).

Tree; branches and petioles pubescent. *Leaves* 3-foliolate; petioles 2–5 cm. long, subterete or shallowly grooved above, pubescent; leaflets obovate or oblanceolate-elliptic, 5–9 cm. long, 1·5–3 cm. broad, broadly acuminate at the apex, cuneate at the

base into a petiolule, glabrous except sometimes on the midrib; lateral nerves numerous, close together; petiolule 0·5–1 cm. long. *Inflorescence* of axillary and terminal racemes at the ends of the branches; peduncles flattened and tomentose; pedicels short, slender and pubescent; flowers unisexual, subglomerate; calyx small, 4-lobed, ciliate; petals 4, twice or more than twice as long as the calyx. *Male flower*: stamens 4; rudimentary ovary of 2 small carpels cohering at the base, thinly hirsute. *Female flower* not seen. *Fruit* of 2 carpels, one often aborted but persisting; carpel oblique, about 1·7 cm. long and 1·3 cm. broad, pubescent at least at the base, 1-seeded. *Seeds* without endosperm.

SOUTH AFRICA. Cape Province: Kentani, *Miss Pegler* 823. Pondoland: *Bachmann* 835.

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LI.—SESSÉ AND MOCIÑO'S PLANTAE NOVAE HISPANIAE AND FLORA MEXICANA. T. A. Sprague.

Martin Sessé, a Spanish physician and botanist, was appointed in 1787 Director of the Scientific Expedition of Nueva España (Mexico and Central America), and in the following year Director of the Botanic Garden, Mexico. During the period 1788–1795 he devoted much time to the examination and description of Mexican plants with the assistance of José Mariano Mociño, who was appointed Botanist of the Expedition in 1791, and made botanical collections in various parts of Mexico and Guatemala. Sessé and Mociño subsequently spent more than eight years, from 1795 to 1804, in more extensive travels through Mexico and Central America, North-west America, Cuba and Puerto Rico.

The botanical results of Sessé and Mociño's investigations and explorations consisted of a herbarium, a set of about 1,400 coloured drawings of Mexican plants, and various manuscripts including a "Flora de Guatemala" in addition to the two works which form the subject of the present note. Sessé and Mociño's herbarium was incorporated in 1820 in the general herbarium of the Madrid Botanic Garden, where their manuscripts are also preserved, but the large collection of original coloured drawings disappeared after Mociño's death in 1819 and its fate is still unknown. A set of their plants, which formed part of Lambert's herbarium, is now in the Herbier Delessert, and some Mexican plants in the Kew Herbarium and British Museum marked "Herb. Pavon" were apparently collected by Sessé and Mociño, and came into Ruiz and Pavon's hands after Mociño had fled from Spain.

The political troubles in Spain in the early part of the nineteenth century prevented the publication of Sessé and Mociño's works. Sessé had died in 1809, and Mociño was obliged to take asylum in Montpellier in 1813, taking with him the manuscripts and the collection of drawings. The latter were lent by Mociño to A. P. De Candolle, who formed a high opinion of their scientific value, and together with other botanists based 17 new genera and 271 new species on them in his Systema and Prodromus. When Mociño returned to Spain in 1817 he asked De Candolle, who had in the meantime moved to Geneva, to return the collection of drawings at very short notice. Mociño had previously given 305 duplicate drawings to De Candolle and 71 drawings had been copied for the latter while still at Montpellier. The remaining drawings were copied in 8–10 days by the combined efforts of about two hundred persons, 860 being copied completely and 109 in outline only. The whole collection was bound in several volumes, and is preserved in the Conservatoire Botanique at Geneva. Ten sets of tracings of the drawings on which new species and genera had been based were distributed in 1874 at cost price to the principal herbaria of the world by Alphonse de Candolle.

While the Sessé and Mociño plants now in the Herbier Delessert were in Lambert's herbarium a number of them were described by

David Don in Trans. Linn. Soc. xiv. 573–577 (1825); xvi. 169–303 (1833); and George Don, Gen. Syst. (1831–1838).

The appearance of the Botany of the Biologia Centrali-americana stimulated interest in Sessé and Mociño's works, and led to the publication in Mexico—after a lapse of nearly a century—of their "Plantae Novae Hispaniae" and "Flora Mexicana," both works being issued in instalments by the "Sociedad Mexicana de Historia Natural" as appendices to their periodical "La Naturaleza" (Ser. II. tom. 1–2) during the periods 1887–1890 and 1891–1897 respectively. Second editions were published in 1893 and 1894 respectively by the "Secretaría de Fomento," Mexico. It follows that nearly half the second edition of the "Flora Mexicana," namely from p. 125, *Myrtus racemosa*, to the end, appeared before the corresponding part of the first edition.

The two works contain descriptions of several hundred species regarded as new by Sessé and Mociño, and of many others which were identified by them—for the most part erroneously—with previously described species. No authorities are cited for the specific names, and it is often difficult to determine whether particular species were regarded as new by Sessé and Mociño, or were supposed by them to be identical with previously described species of the same name, with which they may or may not have been acquainted. The new names should in the normal course of events have been taken up for Durand and Jackson's Supplement to the Index Kewensis, but did not appear in that work. They have now been extracted for insertion in the seventh Supplement. Space does not permit of the publication here of the full list of species, but the following particulars regarding the nature and preparation of Sessé and Mociño's two floras are of more general interest, being essential to the understanding of the problems connected with these authors' species.

According to Ramirez, the "Flora Mexicana" embodies the results of Sessé and Mociño's earlier explorations, which finished in 1795, whereas the "Plantae Novae Hispaniae" was written later. These statements do not appear to be borne out either by the preface of the latter work or by internal evidence. Sessé and Mociño state that their "Plantae Novae Hispaniae" included the plants collected in three years of travel through Nueva España, and that, whilst they were engaged in its preparation, Ortega's edition of the works of Hernandez appeared. As the latter was published in 1790, it seems probable that the "Plantae Novae Hispaniae" embodies only the results of Sessé and Mociño's earlier investigations. The "Flora Mexicana," on the other hand, includes numerous species from Cuba and Puerto Rico, which islands, according to Colmeiro, were not visited by the authors until towards the end of their eight years of exploration from 1795 to 1804. Apparently the "Flora Mexicana," which bore no title in manuscript, was a collection of materials for a series of floras, commenced at an early date by Sessé and Mociño and added to from time to time during their travels. Cervantes in 1794 cited eight new species of *Jatropha* from the unpublished Flora

Mexicana, but singularly enough only one of these, *J. ciliata*, is included in the Flora Mexicana, and another, *J. triloba*, in the Plantae Novae Hispaniae, the remaining six being apparently unrepresented in these works.

Writing before the foundations of floristic plant-geography had been laid by Humboldt and Bonpland's researches, Sessé and Mociño seem to have had little hesitation in identifying indigenous Mexican plants with species from Europe, South Africa, Arabia, India, Malaya, China, and even New Zealand (*Gentiana saxosa*). Apart from a certain number of weeds and cultivated plants nearly all these identifications were erroneous. Apparently they were based on comparison of Mexican plants not with herbarium specimens but with descriptions and figures of Old-world species.

Some material collected during the later part of the Expedition seems to have been referred erroneously by the authors to species already described by them. Specimens belonging to these later collections were doubtless among those which passed into Pavon's hands and afterwards into Lambert's herbarium, where they were described by David and George Don. Thus *Mimosa hirsuta* Moc. et Sessé ex G. Don, Gen. Syst. ii. 383 is certainly not conspecific with *M. hirsuta* Sessé et Moc. Pl. Nov. Hisp. 165, as is evident from comparison of the two descriptions. Similarly *Phaseolus pauciflorus* Sessé et Moc. ex G. Don was evidently not based on the original material described by Sessé and Mociño, for these authors describe the stem as glabrous whereas, according to Don, it is villous. On the other hand certain discrepancies which are observable between De Candolle's descriptions and those of Sessé and Mociño, seem to be due to inaccurate observation on the part of the latter authors, as in the case of *Mimosa esculenta* (*Leucaena esculenta* Benth.), which they described as polyandrous, whereas it is decandrous.

In the interpretation of Sessé and Mociño's descriptions the herbarium specimens at the Madrid Botanic Garden and the drawings at the Conservatoire Botanique at Geneva are of primary importance, whereas the dried specimens in the Herbier Delessert now at the latter institution, and those marked "Herb. Pavon" at Kew and the British Museum are not equally well authenticated. They may in some instances be duplicates of the original specimens described by Sessé and Mociño, but in other cases, e.g. *Mimosa hirsuta*, they were evidently collected at a later date.

Contemporary and subsequent authors published many species bearing the same names as those described in manuscript by Sessé and Mociño. In some cases these are conspecific, in others not. *Zinnia elegans* Sessé et Moc. may be identical with *Z. elegans* Jacq. Coll. Suppl. 152 (1796), seeds of which were received by Jacquin under that name, probably from the Madrid Botanic Garden. Similarly *Coreopsis artemisiaefolia* Jacq. (1796), *Helianthus trilobatus* Link (1822), and *Cacalia sinuata* La Llave et Lexarza (1824) are possibly conspecific with Sessé and Mociño's plants of the same

names. On the other hand *Ageratum viscosum* Ortega (1797), which is described as having linear-lanceolate leaves, can hardly be *A. viscosum* Sessé et Moc., which has ovate leaves, although the former was grown from seeds received from Sessé. Nor does *Cacalia peltata* H.B.K. (1820) appear to be the same as *C. peltata* Sessé et Moc.

Plantae Novae Hispaniae.

No work of later date than 1790 appears to have been consulted by the authors. Among those cited are Linn. Sp. Pl. ed. 1 (1753) (*Lantana corymbosa*), Sp. Pl. ed. 2 (1762–63) (*Salsola Salsa*), Syst. Nat. ed. 12 (1767) (*Verbesina Acmella*), Syst. Veg. ed. 13 (1774) (*Mimosa tenuifolia*), Linn. f. Suppl. (1781), Browne, Jam. (1756), Mill. Dict. ed. 8 (1768) (*Tournefortia suffruticosa* is cited with the diagnostic phrase given in ed. 8), Jacq. Amer. (1763), Jacq. Obs. (1764–71), Jacq. Hort. Vindob. (1770–76) (*Justicia ciliata*), Jacq. Fl. Austr. (1773–78), and Forsk. Fl. Aeg.–Arab. (1775).

Sessé and Mociño had apparently seen neither Aublet's Hist. Pl. Guiane (1775) nor Swartz's Prodr. Veg. Ind. Occ. (1788). *Ficus americana* Sessé et Moc. and *Ixia americana* Sessé et Moc. are evidently different from *F. americana* Aubl. and *I. americana* Aubl., while *Piper cordifolium* Sessé et Moc. and *Melastoma angustifolium* Sessé et Moc. are certainly not conspecific with the species of these names described by Swartz. The work of Linnaeus translated into Spanish by D. Antonio Palacios [Palau], mentioned in the preface to the Plantae Novae Hispaniae was presumably Palau's translation (1784–88) of the Species Plantarum.

That the date of completion of the Plantae Novae Hispaniae was not long after 1790 is suggested by the fact that the authors had evidently not seen the second volume of Cavanilles's Icones, for they describe a *Justicia coccinea* which is obviously different from *J. coccinea* Cav. Ic. ii. t. 199 (1793). Also their *Salvia bicolor* is certainly not conspecific with *S. bicolor* Jacq. Hort. Schoenbrunn. t. 7 (1797). *Eupatorium squarrosum* Sessé et Moc. may possibly be identical with *E. squarrosum* Cav. Ic. i. 66, t. 98 (1791), which Cavanilles described from a Mexican plant which flowered in the Botanic Garden, Madrid, and had doubtless been raised from seed sent by Cervantes, to whom Cavanilles in the preface acknowledges his indebtedness for seeds of rare plants from Nueva España. Sessé and Mociño do not cite Cavanilles's figure and description, so they presumably had not seen it. As the first volume of the Icones contains descriptions and figures of 6 new genera from Mexico and of at least 34 Mexican species, it would almost certainly have been purchased for the Botanic Garden, Mexico, not long after publication, say in 1792 or 1793, if not previously presented by the author.

According to Sessé and Mociño's preface the descriptions in the Plantae Novae Hispaniae were written in the field on a journey of three years' duration through Nueva España. Assuming that the manuscript was completed within six months or a year of the

travellers' return to Mexico City, the time occupied in its preparation would have been about $3\frac{1}{2}$–4 years. As they mention that almost half the work was completed in 1790, the year of publication of Ortega's edition of Hernandez, the date of completion of the Plantae Novae Hispaniae may be assigned provisionally to the year 1792, or possibly to 1793.

After completion of the Plantae Novae Hispaniae Sessé and Mociño revised some of their identifications. Thus under *Mespilus Pyracantha* is the note: "Descriptio *Crataegi Crus-galli* huc pertinet, errore enim *Mespilus* haec inter *Crataegi* species locata fuerat." Both these identifications of the "Texocotl" were erroneous. It is *Crataegus mexicana* Fl. Mex. Ic. Ined. ex DC. Prodr. ii. 629 (1825), which according to Stapf in Kew Bull. 1914, 297, is a synonym of *C. pubescens* (H.B.K., 1824) Steud. Standley, however, regards the two species as distinct.

Flora Mexicana.

This work, unlike the Plantae Novae Hispaniae, was never prepared for publication by its authors, and consists merely of a collection of descriptions bearing purely provisional identifications. About sixty species are unnamed, the place of the specific name being taken by a dash. One (following the genus *Samyda*) has neither generic name nor specific name. A new genus, *Guayabilla*, is represented by two species, *G. odorata* (*Guayabilla floribus decandris*) and a second, unnamed one (*Guayabilla floribus dodecandris*). According to Urban, Symb. Antill. iv. 418 (1910), the former is *Samyda spinulosa* Vent. and the latter is *S. dodecandra*, Jacq. Two species, *Samyda macrocarpa* and *S. rubra*, cited by De Candolle, Prodr. ii. 48 (1825) from "Fl. Mex. Ic. Ined." with the locality "Mexico" have long been regarded as problematical. Hemsley, Biol. Centr. Amer., Bot. i. 470 (1880), listed them as doubtful species, and Standley in Contrib. U.S. Nat. Herb. xxiii. 842 (1923) states that the generic position of both plants is doubtful. Comparison of Sessé and Mociño's description of *Guayabilla odorata* with the description and figure of *Samyda macrocarpa* leaves no room for doubt that these represent the same species, and similarly *Guayabilla floribus dodecandris* appears to be conspecific with *Samyda rubra*. De Candolle was apparently unaware that Sessé and Mociño's Icones included West Indian as well as Mexican plants, and the erroneous locality "Mexico" given by him has hitherto prevented the identification of *S. macrocarpa* and *S. rubra*. It may be useful to give the synonymy and distribution of the two species.

Samyda spinulosa *Vent.* Choix, t. 43 (1803); Urb. Symb. Antill. iv. 418; Britt. et Wils. in Sc. Surv. Porto Rico, v. 594. *S. macrocarpa* Fl. Mex. Ic. Ined. ex DC. Prodr. ii. 48 (1825); Alph. DC. Calques Fl. Mex. t. 183. *Guayabilla odorata* Sessé et Moc. Fl. Mex. ed. 2, 113 (1894).

West Indies. Puerto Rico and St. Thomas.

Samyda dodecandra *Jacq.* Enum. 21 (1760); Urb. Symb. Antill. iv. 418; Britt. et Wils. in Sc. Surv. Porto Rico, v. 594. *S. serrulata* L. Sp. Pl. ed. 2, 558 (1762). *S. rubra* Fl. Mex. Ic. Ined. ex DC. Prodr. ii. 48 (1825); Alph. DC. Calques Fl. Mex. t. 182.

West Indies. Widely distributed both in the Greater and Lesser Antilles.

Among other Puerto Rico species which have erroneously been assumed to be natives of Mexico are *Begonia decandra* Pav. and *Gesneria cuneifolia* Sessé et Moc.

About fifty names of species are duplicated in the Flora Mexicana, and some even occur in triplicate (*Peperomia tuberosa*, *Convolvulus umbellatus*). There are two species named *Ehretia Bourreria*, for example. The second, to which are appended citations belonging to *E. Bourreria* L., was described from a tree observed by the authors at Queretaro in Mexico. The first, which was collected in Puerto Rico, is without citations but was evidently identified subsequently by Sessé and Mociño as the true *E. Bourreria*, judging by their remark as to the Mexican tree: "corrige *Bourreriam* sequentem quae diversa e vera est et forte species nova." The identification of the Puerto Rico plant as *E. Bourreria* L. has been confirmed by Urban, Symb. Antill. iv. 521 (1910). Had Sessé and Mociño prepared the manuscript for press they would have transferred the citations to the first *E. Bourreria* and given the second species a different name.

Sessé and Mociño's Mexican Localities.

The West Indian and the few Central American localities mentioned by Sessé and Mociño offer little difficulty. Urban in his Flora Portoricensis has taken up the Puerto Rico plants cited by them. Their Mexican localities, however, are difficult to identify for several reasons. In many cases they are quite small places which are not included in any ordinary atlas or gazetteer; sometimes the spelling is so different from the modern form that a name may be almost unrecognisable to anyone unfamiliar with Spanish; and in a few cases the names are given in their classical, mediaeval or ecclesiastical Latin form. Also many different places in Mexico are named after the same saint. One of the localities cited very frequently is Mazatlan, which is not the well-known seaport of that name in Sinaloa, but a village near Chilpancingo in Guerrero, passed through by Humboldt and Bonpland in 1803. With regard to the spelling the following hints may be found useful. The letter "h" in words of Indian origin is frequently replaced by a "g," Acaguisotla and Acahuizotla for example being different forms of the same name. "Qu" is frequently replaced by "Cu" as in Quahnahuaca, the modern Cuernavaca. A "z" may be replaced by a "c" before an "e" or an "i" and by an "s" before an "a," "o," "u" or a consonant. The letters "x" and "z" are also used more or less indifferently: Ixtla, Iztla and Istla all being forms of one name. An "x" is now frequently replaced by a "j" e.g. Xorullo, Jorullo; and "oa" and "ua" are employed indifferently in many place

names, e.g. Coahuayana or Cuahuayana. Salmantica was the classical Latin name of Salamanca (Spain) and was employed for the town of Salamanca in Guanajuato, Mexico. Vallisoletum was the mediaeval Latin name for Valladolid (Spain), and was used by Sessé and Mociño for Valladolid de Michoacan, now known as Morelia. Michaelopolis and Angelopolis respectively are the ecclesiastical Latin names of San Miguel de Allende and Puebla (de los Angeles).

The area in Mexico explored by Sessé and Mociño, as evidenced by the localities cited by them, extends northwards to the States of Sinaloa, Nayarit (Tepic), Jalisco, Guanajuato, Queretaro, Hidalgo and Vera Cruz, and south-eastwards to the western parts of Tabasco and Chiapas. They appear to have collected very few plants in Sinaloa, Nayarit, Oaxaca, Chiapas and Tabasco. The Vera Cruz records are mainly in the Flora Mexicana, there being very few species cited in the Plantae Novae Hispaniae from Vera Cruz, Puebla and Hidalgo, so that the detailed exploration of these states was presumably subsequent to 1792 (*see* p. 421). Among those explored up to 1792 and hence represented in the Plantae Novae Hispaniae were Mexico, Morelos, Guerrero, Michoacan, Jalisco, Guanajuato and Queretaro. Jalisco and Michoacan are represented by numerous additional localities in the Flora Mexicana, so that Sessé and Mociño evidently revisited these States during the later period of their explorations.

The maps of various parts of Mexico given by Humboldt and Bonpland in their Atlas Géographique et Physique are very helpful in determining the position of Sessé and Mociño's localities, as they include numerous place-names, such as Agualulco (Ahualulco) not traced elsewhere. The writer's account of Humboldt and Bonpland's Mexican Itinerary may also be consulted. Some of Sessé and Mociño's Mexican localities have not been traced. An alphabetical list of those which have been determined is appended, the State in which each occurs being indicated. The following abbreviations are adopted: Chis. (Chiapas), Col. (Colima), Gto. (Guanajuato), Gro. (Guerrero), Hgo. (Hidalgo), Jal. (Jalisco), Mex. (Mexico), Mich. (Michoacan), Mor. (Morelos), Nay. (Nayarit, until recently known as Tepic), Oax. (Oaxaca), Pue. (Puebla), Qro. (Queretaro), Sin. (Sinaloa), Tlax. (Tlaxcala), Ver. (Vera Cruz).

Acahuizotla, Gro.; Acaponeta, Nay.; Acapulco, Gro.; Acatlipa, Mor.; Acayucan, Ver.; Agualulco (Ahualulco), Jal.; Alvarado, Ver.; Amatitlan, Jal.; Amatlan, Ver.; Amecameca, Mex.; Angelopolis, Pue.; Apam, Hgo.; Apatzingan, Mich.; Ario, Mich.; Atohuilco, Gto.; Atatonilco, Gto.; Atotonilco el Grande, Hgo.; Ayacapistla (Ayacapixtla), Mex.; Ayahualtempan, Gro.

Calpulalpam, Tlax.; Carmelitarum Eremus, Mex.; Chacalapa, Mich.; Chapala, Jal.; Chapalicum Mare, *i.e.* Lago de Chapala, Jal.; Chapultepec, Mex.; Chapultepec, Mor.; Chichipilco, Mex.; Chilapa, Gro.; Chilpantzingo, Gro.; Chucandaro (Chucandiro), Mich.; Citacuaro, Mich.; Coahuayana, Mich.; Coatzacoalcos, Ver.;

Colima, Col. ; Colima, Volcan de, Jal. ; Comangilla, Gto. ; Cordoba, Ver. ; Coyoacan, Mex. ; Cozoliacaque, Ver. ; Cuahunahuaca, Mor. ; Cuahuayana, Mich. ; Cuaxinipilapa, Gro. ; Cuitzeo, Laguna de, Mich. ; Cuyohuacan, Mex. ; Cuyuacan, Mex.

Eremus P.P. Carmelitarum, Mex. ; Espinal, Ver.

Guadalajara, Jal. ; Guanajuato, Gto.

Huasteca, Ver. ? ; Hostotpaquillo (Hostotipaquillo), Jal.

Ixtacalco, Mex. ; Ixtapalapan, Mex. ; Ixtla (Iztla), Qro. ; Ixtla, Puente de, Mor. ; Ixtlac, Qro. ; Ixtlahuaca, Mex.

Jucutacato, Mich.

La Punta, Ver. ? ; Legio (Leon), Gto.

Maltrata, Ver. ; Mazatlan, Gro. ; Metepec, Mex. or Hgo. ; Mextitlan (Meztitlan), Hgo. ; Mezquite, Sin. ; Michaelopolis, Gto.

Nandio, Mich.

Oaxaca, Oax. ; Ocotepec, Chis. ; Ocuapan, Ver. ; Orizaba, Ver.

Papantla, Ver. ; Paranquera, Gto. ; Paranques, Gto. ; Patzquaro, Mich. ; Puruandiro, Mich.

Quahunahuaca, Mor. ; Quaxinipilapa, Gro. ; Queretaro, Gro. ; Quyaucan, Mex.

Regla, Hgo.

Salamanca, Gto. ; Salmantica, Gto. ; San Agustin, Mex. ; San Andres de Tuxtla, Ver. ; San Angel, Mex. ; San Bartolomé, Qro. ; San Damiano, Gto. ; San Felipe del Obrage, Mex. ; San Francisco, Mex. ; San Gerónimo, Gro. ; San Juan de los Lagos, Jal. ; San Juan de los Plátanos, Mich. ; San Juan del Rio, Qro. ; San Lorenzo, Ver. ; San Martin de Tesmeluca, Pue. ; San Miguel de Allende, Gto. ; San Nicolas, Mex. ; Santa Ana de Amatlan, Mich. ; Santa Maria (Nuestra Señora) de los Remedios, Mex. ; Santa Maria de Tetela, Mor. ; Santa Monica, Hgo. ; Santa Rosa, Gto. ; Sararacua, Mich. ; Sayula, Jal. ; Sinaloa, Sin. ; Sultepec, Mex.

Tacubaya, Mex. ; Tarimbaro, Mich. ; Tehuacan, Pue. ; Temascaltepec, Mex. ; Temascatio, Gto. ; Tenampulco, Ver. ? ; Tepalcatepec, Mich. ; Tepecuacuilco, Gro. ; Tepelpa, Mex. ; Tepetlapa, Gro. ; Tepetlpa, Mex. ; Tepic, Nay. ; Tepoztlan (Tepostlan), Mor. ; Tequila, Jal. ; Tesmeluca, San Martin de, Pue. ; Tetela, Santa Maria de, Mor. ; Tezcuco, Mex. ; Teziutlan, Pue. ; Tixtla, Gro. ; Tlacotalpam, Ver. ; Tlaltenango, Mor. ; Tlapa, Gro. ; Toluca, Mex. ; Tonila, Col. ; Tospa, Ver. ; Tulancingo, Hgo. ; Tuxtla (Tustla), Ver.

Uruapan, Mich.

Valladolid, Qro. ; Valle de Santiago, Gto. ; Valle, Oppidum del, *i.e.* Valle de Santiago ? ; Vallisoletum, Qro. ; Vera Cruz, Ver.

Xochitepec, Mor. ; Xorullo, Mich.

Yecapixtla, Mor.

Zacatlan, Pue. ; Zapotlan, Jal. ; Zitacuaro, Mich. ; Zitlala, Gro. ; Zitlalan, Gro. ; Zumpango, Mex.

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LII.—INLAND OCCURRENCE OF IPOMOEA PES-CAPRAE. I. H. Burkill.

This valued sand-binder occurs so plentifully and widely upon tropical sea-coasts that it is well known to every botanist who has visited them. But that it is able to maintain itself in inland situations is not generally known, and the records given below are of interest since they show that it occurs on the

western side of the Malay Peninsula at some distance from the sea shore where the natural vegetation has been disturbed by man. Mr. Ridley, who observed it in 1920 (Journ. Roy. As. Soc., Straits Branch, 86, p. 301, 1922), suggested that it may have been introduced in a load of sea sand. This, however, appears to be doubtful from the fact that its occurrence inland is reported in some of the earliest records of botanical exploration of the country; and as it is now known to occur in several inland situations such a means of introduction, though it might happen once, becomes improbable for all.

Mr. Ridley has also recorded (loc. cit.) that he observed, apparently in 1920, *Ipomoea Pes-caprae* upon a railway embankment near Kota Bahru in Kelantan. This railway embankment is relatively new, and the position is close to the head of a small sandy delta, so that there is much less of the unexpected in the existence of the plant at this place than in the finding of it in the interior of the Peninsula upon the other or western side.

It appears likely that it has penetrated inland along the roads following the opening of the country which proceeded from Malacca. The first roads through these parts were made after 1850, and they were extended beyond Seremban after 1880.

Mr. C. E. C. Fischer reports that he has found it in the Madura district of the Madras Presidency at Sendurai, which is a long distance from the sea and at an elevation of 1300 ft. In the Herbarium at Kew, there is also a specimen from the village of Buddi-reddi-patti in the Salem district, a spot equally remote from the coast.

It would appear that *Ipomoea Pes-caprae* might prove a useful cover for abandoned mine workings within the area where it has been found to exist inland. Should the experiment be made care should be taken at the time of sowing to see that the surface of the ground is of an open texture.

The following are records of *Ipomoea Pes-caprae* in inland localities in Malacca and Negri Sembilan. The distances from the sea are measured from the locality to the nearest sea shore in a straight line; the other distances are by road.

Belimbing, 13½ miles from Malacca, 10 miles from the sea; *Burkill*, Nov., 1918. North of Alor Gajah, 16 miles from Malacca, 10½ miles from the sea, *Burkill*, Nov., 1916. Sempang Ampat, 20 miles from Malacca, 11 miles from the sea, *Burkill*, July 1917. Chirana Puteh, 23 miles from Malacca, 13 miles from the sea, *Alvins* (Cantley's collector), Feb., 1885. Tanjong Rimau, 21 miles from Malacca, 15 miles from the sea, *Burkill*, Nov., 1918. Pulau Sabang, 23 miles from Malacca, 14½ miles from the sea, *J. S. Goodenough*, May, 1894. Near Tampin, 25 miles from Malacca, 15½ miles from the sea, *Burkill*, June 1921. Bukit Tangga pass, 35 miles from Port Dickson, 66 from Malacca, 17½ miles from the sea, *Ridley*, Dec., 1920.

LIII.—MISCELLANEOUS NOTES.

The following appointment has been made by the Secretary of State for the Colonies:—Mr. D. STURDY, Assistant Agricultural Officer, Tanganyika Territory.

WILLIAM FAWCETT.—We regret to record the death of Mr. William Fawcett, which took place suddenly at his residence at Blackheath on August the 14th. Born in 1851, he became a master at Southborough School, Tunbridge Wells, and graduated B.Sc. at London University. He then hesitated between devoting himself to mathematics or to a branch of natural science, but success in 1880 in obtaining an Assistantship in the Botanical Department of the British Museum determined his career. With his colleague, Mr. H. N. Ridley, he assisted in transferring the collections from Bloomsbury to South Kensington. In 1884 his first botanical paper, "Dialysis and Synanthy in Primula," appeared in the Journal of Botany, and in 1886 one on *Balanophora* and *Thonningia* in the Transactions of the Linnean Society. Several other papers from his pen appeared about this period, and he remained at the British Museum until the end of 1886, when he became Director of Public Gardens and Plantations in Jamaica, in succession to Mr. (now Sir) Daniel Morris, who had then been appointed Assistant Director at Kew. He took up his appointment in 1886, and immediately threw himself into his work. He edited the Bulletin of the Botanical Department of Jamaica from April, 1887, until 1902, and when the Department was amalgamated with that of Agriculture, he undertook the editorship of the new bulletin from 1903 until his retirement in 1908. These publications contained many articles from Fawcett's own pen, noticeable among them being a "Provisional list of the Indigenous Flowering Plants of Jamaica" (1893); "An Index to Economic Products of the Vegetable Kingdom in Jamaica" (1893); and "Historical Notes on Economic Plants in Jamaica" (1908), the last dealing largely with the attempt to produce cigars and tobacco in Jamaica. Encouraged by the formation in 1898 of the Imperial Department of Agriculture, with Sir D. Morris as Commissioner, Fawcett vigorously threw himself into the task of developing new vegetable resources to take the place of the then threatened failure of the sugar crop, which had hitherto been almost the sole industry of Jamaica. The worth of this can be estimated by the value of the exports in 1924, that of sugar being £497,723, while fruit and nuts had risen to £1,432,476, coffee to £225,449 and cocoa to £82,022. In addition to his writings he also delivered lectures, and in 1891 rendered valuable service in connection with the Imperial Exhibition in Jamaica.

Fawcett returned to England in 1908 and commenced, with Dr. A. B. Rendle, a Flora of Jamaica, the first volume of which, dealing with *Orchidaceae*, was published in 1910, and was succeeded by vols. iii., iv. and v., the last of which appeared in July, 1926.

During the progress of this work Fawcett frequently visited Kew to examine Jamaican collections not represented at the British Museum, the last occasion being on July the 29th. He also found time in 1913 to write a book on "The Banana: Its Cultivation, Distribution and Commercial Uses", a subject on which his experience in Jamaica had rendered him well qualified to write.

Mr. Fawcett became a Fellow of the Linnean Society in 1881, withdrew in 1915, but rejoined in 1923. C. H. W.

Sir George Holford.—Horticulture has sustained no severer loss in recent years than that caused by the death on September 11th of Lieut.-Colonel Sir George L. Holford, K.C.V.O., C.I.E., C.B.E., and Kew thereby has been deprived of an old and generous friend. Very few private establishments in this country have been able to practice gardening in so many branches and in such perfection as Westonbirt during the last thirty years under Sir George's direction. His orchids, Hippeastrums and Clivias have long represented the highest types of quality and cultivation, and for many years the exhibits he made at the Royal Horticultural Society's shows have been amongst the chief events in the gardening world.

No feature of Westonbirt was more admired than the Arboretum. It was commenced many years ago by Sir George's father, Robert Stayner Holford, and enthusiastically maintained by his son. Amongst the private collections of hardy trees and shrubs in England it has few rivals in regard to the size and beauty of its individual specimens combined with a richness in number of species and an admirable planting. In no garden in England, perhaps, is the autumn colouring of trees and shrubs so rich and varied as at Westonbirt, and it was one of Sir George's greatest pleasures to entertain every year a succession of visitors there to enjoy its beauties at that season.

Sir George's first gift to Kew was one hundred Hippeastrums sent in March, 1895; his last a tree of *Acer rufinerve* var. *limbatum* in February, 1924. Between those dates he made numerous presentations, including three other consignments of Hippeastrums and many orchids. Two consignments of the latter were especially generous—over two hundred plants in January, 1913, and over six hundred in April, 1922. Many of these were hybrid Cattleyas and Laelias raised at Westonbirt, and their flowering has given much enjoyment year by year to visitors to the Gardens.

Sir George was born June 2nd, 1860, and was buried at Westonbirt on Tuesday, September 14th, Kew being represented at his funeral by the Assistant Director.

A Nature Reserve in Wellington, New Zealand.—We have received from Dr. L. Cockayne, F.R.S., a most interesting account of a project for the establishment of a natural vegetation reserve at Wilton's Bush, Wadestown, within the boundaries of the City

of Wellington, and less than three miles from the centre of the city.

The object of the scheme is to present a vivid picture of the plant-life of New Zealand, to show the species of which the vegetation is composed, and to illustrate their use for horticultural purposes. The main features of this open-air museum will be (1) a well-grown collection of, as far as possible, all the species of the New Zealand flora from the North Cape to the south of Stewart Island, including the Kermadecs, Chathams, and Sub-Antarctic Islands, arranged for the most part in systematic order; (2) representations on a fairly large scale of the leading plant-associations of the land as they existed in primeval New Zealand; (3) illustration of the horticultural uses of suitable New Zealand plants; (4) restoration of the forest as far as possible to its primitive condition.

The crux of the whole scheme is the reproduction of the rapidly disappearing primeval vegetation of New Zealand. Day by day its area grows less; some associations are gone for ever, others are most limited in extent. It is hoped to perpetuate the glories of this vegetation in a way which can never be accomplished by photographs or within the walls of a museum.

Dr. Cockayne points out that much of the forest in the Reserve has been greatly modified, and even damaged. The plants are very slowly being restored, but not in their original form, and the work can be accomplished much more rapidly by human agency. It has, however, been clearly recognised that no species should be added to the bush which does not properly belong to that class of forest—the semi-coastal forest of Wellington. The intention is, strictly, to bring back the forest to its original composition and status.

In his covering letter Dr. Cockayne says:—

"Some of the present forest is very fine and virtually virgin, but the greater part has had the tall trees removed years ago and now largely consists of *Brachyglottis repanda*. Of course it will be impossible to reproduce certain of the plant associations of New Zealand, e.g. those of the Sub-Antarctic Islands, but a considerable number can be imitated and their members should grow quite well. It is the systematic part which will give the most trouble, since certain species will refuse to grow at all alongside their relatives, e.g., lowland and sub-alpine podocarps. Anyhow, to attempt to overcome difficulties adds special zest to horticulture."

It is unnecessary to stress the importance of this scheme from both the educational and aesthetic points of view. Its development, which will of course be a matter of many years, will be watched with the greatest interest. One may hope that this example will stimulate the establishment of similar reserves in many other parts of the world, so as to preserve authentic illustrations of characteristic vegetation, which is everywhere giving way before civilization and cultivation.

Oil-Palm Briquettes.—An interesting feature in the operations of a palm oil factory in existence on the Gold Coast is the use made of the waste fibre accumulating after the extraction of the pericarp oil, and from the shells of the palm "nuts" after cracking and removal of the kernels has been effected. A fuel briquette is made from these two waste products and constitutes the sole fuel used on the small locomotives for hauling palm fruit from the outlying collecting areas to the central factory. The briquettes are most convenient for this purpose, being easy to handle, fairly durable, and burning with much heat. The composition is approximately 55 per cent. shell and 45 per cent. fibre by weight; the briquettes being disc-shaped with a diameter of 10–11″ and thickness $2\frac{1}{2}$–3″. The fibre and shell being well mixed before moulding, the pressure of the moulds compresses fibre and shell into a dense compact mass, rendering the addition of any outside binding material unnecessary. F. N. H.

The Flora of Jamaica.*—A copy of Volume v of this valuable work by the late Mr. W. Fawcett and Dr. A. B. Rendle (which appeared in July last) has been presented to the Library of the Royal Botanic Gardens, Kew, by the Trustees of the British Museum. The present volume continues the systematic account to the end of the free-petaled Dicotyledons, forty-four families being dealt with (including *Garryaceae* omitted from the 3rd volume). Each genus is well illustrated, and a full index is given.

Edible and Poisonous Fungi.†—Owing to the demand for this useful little handbook, which has been out of print for some years, a new edition has been published. Seven new plates by Miss E. M. Wakefield have been substituted, and the nomenclature and descriptions of the various fungi have been brought up to date. With the new plates and the amplified descriptions the value of the handbook is greatly increased.

Carnations.‡—This, the latest book on Carnations, runs to nineteen chapters, including one on the history of the various classes of Carnations and Pinks. The author has a lifelong experience of carnation growing on commercial lines, and all the cultural details,

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* Flora of Jamaica: containing descriptions of the flowering plants known from the island, by W. Fawcett and A. B. Rendle. Vol. v. Published by the Trustees of the British Museum, London, 1926. Pp. xxviii + 453, text figs. 156. Price 25s.

† Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W. 1, 1926, pp. 29, coloured plates 25. Price, cloth boards, 3/-, post free, quarter boards, 2/6, post free.

‡ By Montagu C. Allwood. Country Life, 20, Tavistock Street, Covent Garden, W.C. 2. 1926. Pp. xvi + 139, ill. 99. Price 12s. 6d.

from the various methods of propagation and cultivation are dealt with in a very efficient way, and in such detail that the veriest beginner should have no difficulty in grasping the various cultural details of this charming class of plants. The book also includes much valuable information for both the skilled amateur and commercial grower. Soils, manures, and the various types of growing houses are dealt with in a very helpful manner. Chapters on diseases and insect pests and the various methods of controlling them are also included. The book is profusely illustrated, with excellent illustrations, showing in a very helpful manner the many operations connected with the cultivation of this class of plant. In dealing with the history of the Perpetual Carnation, the author states that it is the product of several centuries of hybridization and culture, from *Dianthus chinensis*, the Indian or China Pink ; it would be interesting to know on what authority the author makes this statement, as the plant in question is an annual species introduced in 1713.

Citrus Growing.*—In view of the increasing importance of the trade in Oranges and other Citrus fruits from South Africa, a book on Citrus growing in the Union seems well-timed. The commencement of the industry dates from about 1907 subsequent to the first exhibit of Citrus fruits, chiefly from the Transvaal, at the Royal Horticultural Society's Exhibition of Colonial Fruits at Westminster, June, 1906. From then onwards the exports have steadily increased from small beginnings to the present time, when the productive area is estimated to cover 25,000 acres. The industry is now so well established that large consignments of Oranges and smaller quantities of Grape-fruit, Naartjes (Mandarin and Tangerine Oranges) and Lemons, arrive at Southampton nearly every week, at the present time of year. At the moment it does not seem possible to determine the limits of future imports. This excellent position has not been arrived at without considerable energy and the surmounting of many difficulties on the part of the various Departments of Agriculture in the Union, the sympathy of the Colonial Government and the co-operation of the Steamship Companies. The author of the work under notice has given a very complete record of the progress of the production, based on the scientific work of his Department in developing the cultivation of the best varieties, the best methods of grading and packing of the fruit for export and advice on the treatment of diseases and pests ; the book is well illustrated throughout.

J. H. H.

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* Citrus Growing in South Africa, by R. A. Davis. L. Reeve & Co., Ltd., London, 1924. Pp. 309, numerous illustrations. Price £1 5s.

Botanical Magazine.—Part iv of Volume cli (1925) was published on September 21st, 1926, and contains plates and descriptions of the following plants :—

Rhodospatha Forgetii N.E.Br. (t.9105), from Costa Rica; *Cotoneaster ambigua* Rehder & Wilson (t.9106), from altitudes of about 3000 m., Central Szechuan to N.W. Yunnan; *Primula Inayatii* Duthie (t.9107), from the Western Himalaya and Kashmir; *Fritillaria libanotica* Baker (t.9108), a native of dry stony ground in Palestine and South Syria; *Cirropetalum miniatum* Rolfe (t.9109), an orchid with brilliant orange coloured flowers, from Annam and Upper Laos; *Brunnera macrophylla* I. M. Johnston (t.9110), frequently mistaken for a *Myosotis*, from Western Caucasia; *Sargentodoxa cuneata* Rehder & Wils. (tt.9111, 9112), an interesting climbing shrub from Central China, is discussed at length and its position determined in a new Natural Family, the SARGENTODOXACEAE, between the Schizandraceae and Lardizabalaceae; *Diplomeris hirsuta* Lindl. (t.9113), a rare orchid from the Central Himalaya, Nepal to Bhutan; *Anemone glauciifolia* Franch. (t.9114), from N.W. Yunnan and the Szechuan borderland; and *Scabiosa anthemifolia* Ecklon and Zeyher (t.9115), from Cape Colony.

South African Flowers.*—The Wild Flower Protection Society of South Africa, is to be congratulated on the publication of a popular book on the protected wild flowers of the Cape Region. The Society was fortunate in having secured the services of Mrs. H. M. L. Bolus, Curator of the Bolus Herbarium and one of the most prominent of South African botanists. In collaboration she has had the assistance of Miss D. Barclay and Mr. E. J. Steer, who have provided a series of interesting paintings and photographs respectively. The descriptions are charmingly written and many of the plants figured are familiar objects in our gardens. This book should prove to be very useful to visitors and of considerable interest to many of us at home who are interested in the Cape Flora, besides attaining its principal object which is to secure the preservation of these plants in their wild state.

I. C. V.

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* A Book of South African Flowers, by D. Barclay, H. M. L. Bolus, E. J. Steer. Pp. xviii+174, ill. 57. L. Reeve & Co., London, 1925. Price 21s.

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BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1926

ROYAL BOTANIC GARDENS, KEW

LIV.—DECADES KEWENSES PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATORUM. DECAS CXV.

1141. **Shorea sericeiflora** *Fischer et Hutch.* [Dipterocarpaceae]; affinis *S. gratissimae* Dyer, sed nervis lateralibus numerosioribus, floribus sericeo-villosis valde majoribus, sepalis fructiferis majoribus differt.

Arbor; ramuli hornotini brevissime pubescentes, annotini glabrescentes. *Folia* ovato-elliptica vel oblongo-lanceolata, basi rotundata vel leviter cuneata, apice acute vel subacute et sensim acuminata, 6·5–12·5 cm. longa, 2·5–5 cm. lata, rigide chartacea, glabra; nervi laterales utrinsecus circiter 16, a costa sub angulo 45 abeuntes, marginem versus arcuati, nervis tertiariis inconspicuis; petioli 1·5–2 cm. longi, tomentelli demum glabri. *Paniculae* terminales, multiflorae, folia superantes; ramuli angulares pubescentes. *Flores* subsessiles, basi articulati; bracteae anguste oblongae, apice rotundatae, 1·3 cm. longae, extra puberulae. *Sepala* ovato-lanceolata, ad apicem obtusum angustata, exteriora basi subcordata, usque ad 1 cm. longa, 3 mm. lata, extra molliter tomentosa, intra glabra. *Petala* sinistrorso-contorta, oblique oblongo-elliptica, obtusa, circiter 1 cm. longa, 0·5 cm. lata, alabastro parte exteriore sericeo-villosa, ceterum glabra. *Stamina* circiter 27, minutissime papillosa, 0·5 cm. longa, apice longe et graciliter setosa; filamenta basi dilatata. *Ovarium* ovoideum, basi glabrum, superne furfuraceum, in stylum inferne furfuraceum superne glabrum angustatum; stigma trilobatum, lobis patulis. *Fructus* ovoideus, 1·5 cm. longus, 1·2 cm. diametro. *Sepala fructifera* 3 exteriora oblongo-linearia, apice rotundata, basi vix angustata, usque ad 13 cm. longa et 1·6 cm. lata, minutissime puberula, 11–12 nervia, 2 interiora usque ad 7·5 cm. longa, acuta.

BURMA. Pegu Circle, *Conservator of Forests* 1954 (type); vernacular name: Kabanthangyin. Tenasserim; Zadi Circle, *Maung Po In* 11692; vernacular name: Thingaubyu.

1142. **Zanthoxylum mazatlanum** *Sandwith* [Rutaceae-Zanthoxyleae]; *Z. ferrugineo* Radlk. costaricensi quam speciei ulli alii affinius, ab eo praesertim foliolis multo paucioribus, floribus minoribus, gynaecio omnino glabro differt.

Arbor, ramulis albo-cinereis glabris rugosis 3 mm. diametro, spinis fortibus numerosis 2–8 mm. longis armata, partibus novellis iuventute lana ferruginea decidua praeterea pilis brevibus albis densis persistentibus vestitis. *Folia* juniora glomerata, impari-

(795). Wt. 55—7. 1,000. 12/26. Wy. & S., Ltd. Gp. 50 (4).

pinnata, 1·5–2·5 cm. longa, adulta non visa; petiolus 0·7–1·5 cm longus, ut rhachis costae foliolorum et inflorescentia indument supra descripto indutus; foliola 1–3-juga, lanceolato-elliptica a ovato-oblonga, obtusa, leviter sinuato-dentata, sinibus glandula magnas ferentia, utrinque quam aliae partes novellae sparsiu adpressiusque pilosa, costa subtus conspicua, 0·5–1 cm. longa 1–4 mm. lata; rhacheos internodia 2–5 mm. longa. *Inflorescen tiae* glomeratae, 1–3·5 cm. longae, compositae; rami corymbi densis 3–12-floribus terminati; pedicelli 2–3 mm. longi. *Flore* dioici, sepalis destituti. *Florum ♂ petala* adulta 6–10, linearia obtusa, apice rubro-fusca et pilosa, inaequalia, pleraque 1 mm longa, cetera fere dimidio minora; stamina 4–5, cum petalis alter nantia, sub ovario rudimentario affixa, filamentis 0·75 mm. longis antheris circiter 0·8 mm. longis, 1 mm. latis. *Florum ♀ petal* eadem atque in floribus staminatis; gynaecium disco sessile unicarpellatum, glabrum, vix 1 mm. longum, facie nigra punctata glandulis peltatis brunneis praeditum, cum forma fere obtriangu lari, apice truncato et dorsaliter conspicue gibboso; stylus lateralis glaber, cum stigmate umbilicato-capitato 1 mm. longus.

Mexico. Sinaloa: Mazatlan; Los Zapotes, El Chuelite, 50 m *Gonzalez Ortega* 5210 (type in Herb. Kew.).

Vernacular Name: Muelilla.

A very distinct plant, with the asepalous flowers of *Z. amer canum* and *Z. ferrugineum*, and still further allied to the latte species by its unicarpellate gynaecium and by the curious ferru gineous wool of the young shoots.

1143. **Bursera concinna** *Sandwith* [Burseraceae]; *B. laxiflora* S. Wats. et *B. filicifoliae* Brandegee affinis, ab ambabus form numeroque foliolorum, praeterea ab illa inflorescentiis glabris, a hac foliorum indumento glabrescenti differt.

Arbor parva 4 m. alta, trunco 30 cm. diametro; ramuli 2 mm diametro, cinereo-fusci, annotini glabri, sulcati, hornotini brevis simi, pubescentes. *Folia* glomerata, imparipinnata, 2–4 cm longa; petiolus pubescens, 0·7–1 cm. longus; rhachis gracilis pubescens, leviter alata, internodio infimo fere aptero, internodii 4–6 mm. longis; foliola 4–5-juga, vulgo 5-juga, rhomboideo lanceolata vel querciformia, nunc apice obtuse trilobata, nunc part superiore alte et acute pinnatim incisa, raro etiam ea jugorum inferiorum et praesertim jugi secundi ternata cum petiolulo alat sed folia numquam vere bipinnata, versus summum folium terminal excepto descrescentia, 0·5–1·8 cm. longa, 0·2–1 cm. lata, supr glabra vel in costa inconspicue pubescentia, subtus in costa satis con spicua nervisque lateralibus rete venularum conjunctis pubescentia *Inflorescentiae* axillares, graciles, glabrae, 2–4 cm. longae, igitu folia aequantes, pedicellos 2–3 alternos gracillimos glabros 4–8 mm longos emittentes; bracteae conspicuae, lineares vel lineari spathulatae, ad 4 mm. longae, saepe persistentes. *Sepala* 4, glabra cum petalis alternantia et eis dimidio breviora, sub fructu per sistentia. *Petala* 4, 2·5 mm. longa. *Stamina* 8, glabra, circite

1 mm. longa, antheris oblongis. *Ovarium* ovoideum, glabrum, 1·5 mm. longum, stylo stigmatibusque duobus inclusis. *Drupa* bivalvis, ovoidea ad subpyriformis, stylo apiculata, fusca, rugosa, glabra, 7–8 mm. longa. *Pyrena* ovoidea, 6·5 mm. longa, parte superiore nigra et opaca, inferiore arillodio carnoso croceo obtecta.

Mexico. Sinaloa; El Pozole, Ahome, 10 m., *Gonzalez Ortega* 5567 (type in Herb. Kew.): Sonora; Agiabampo, *Palmer* 797 (collected in 1890, distributed as *B. laxiflora* S. Wats.).

Vernacular Name: Torote.

1144. **Echeveria brachyantha** *Sprague* [Crassulaceae]; *E. bifidae* Schlecht. necnon *E. pumilae* Van Houtte similis, ab hac inflorescentia furcata, ab ambabus foliis apiculatis tantum nec mucronatis, floribus multo minoribus.

Caulis simplex, circiter 15 cm. longus et 6 mm. diametro, ut folia scapusque glaucus; internodia inferiora circiter 1·5 cm. longa, superiora sensim abbreviata, foliis rosulam terminalem efformantibus. *Folia* arcuato-ascendentia, spathulato-oblanceolata, brevissime apiculata, 3–4 cm. longa, 1–1·4 cm. lata, 5–6 mm. crassa, supra leviter concava vel plana, subtus late convexa. *Scapus* axillaris in toto circiter 28 cm. longus; pedunculus basi 4 mm. diametro, apice vix 2·5 mm. diametro, inferne viridiusculus, ceterum rubescens; bracteae parvae; bractea infima 1 cm. longa, 4 mm. lata, circiter 5 cm. supra basin inserta. *Cymus* terminalis, bifurcatus; rami arcuati, 6–7·5 cm. longi, floribus modo scorpioideo dispositis, ramo altero 9-floro, altero 6-floro; bracteae oblongae, acutae, basi breviter sagittatae, 6–7 (–11) mm. longae, 2·5 (–4) mm. latae; pedicelli sub anthesi circiter 7 mm., sub fructu circiter 10 mm. longi, inferiores tamen 4–6 mm. longi tantum. *Flores* pentameri, circiter 6 mm. longi et 11 mm. diametro. *Calyx* glaucus, basi late truncatus vel excavato-truncatus; lobi usque ad 0·5 mm. supra basin sejuncti, ovato-oblongi, obtusi, 4–5 mm. longi, 2·5–3 mm. lati. *Corolla* carnea, breviter campanulata; tubus 2 mm. longus; lobi ovato-oblongi arcuato-recurvi, 5·5 mm. longi, vix 3·5 mm. lati, sub lente flavidi, dense roseo-maculati, itaque sub oculo nudo carnei. *Stamina* 10; stamina oppositisepala intra sinus affixa, 3 mm. longa; filamenta 1·5 mm. longa, a basi 0·8 mm. lata ad apicem 0·2 mm. latum sensim angustata; antherae oblongo-lineares, apiculatae, 1·75 mm. longae; stamina oppositipetala 3 mm. supra basin affixa; filamenta circiter 1 mm. longa, basi 0·5–0·6 mm. lata; antherae 1·5 mm. longae. *Glandulae extracarpellares* flavae, semilunatae, margine superiori recto, inferiori curvato, 1·5–2 mm. latae, 0·3 mm. altae. *Carpella* 5; ovaria trigona extrorsum convexa, ovato-oblonga ab interiore visa, vix 4 mm. longa, 1·8 mm. lata, 1·7 mm. crassa; stylus circiter 1·5 mm. longus; ovula numerosissima, multiseriata.

Described from a living specimen cultivated by Mr. N. E. Brown. Native country unknown, possibly Mexico, as it is evidently related to a group of Mexican species represented by

E. bifida, *E. pumila* and *E. secunda*. The possibility of a hydric origin, however, cannot be excluded.

1145. **Sedum tillaeoides** *Duthie* in Rep. Bot. Gard. Saharanpur 1884–5, 32 (1885), nomen; Gard. Chron. 1886, n.s. xxv. 299 nomen; Strachey, Cat. Pl. Kumaon, ed. Duthie, 64 (1906), nomen [Crassulaceae]; S. *perpusillo* Hook. f. & Thoms. affinis, foliis longioribus, sepalis latioribus infera basim prolongatis, petalis et filamentis angustioribus, seminibus numerosioribus minoribus differt. Descriptio C. E. C. Fischer confecta.

Herba parva, ramosa. *Folia* alterna, sessilia, supra basim affixa, lineara vel anguste oblongo-lanceolata, 1·2 cm. longa, ad apicem obtusum angustata, glabra, parte libera basalis vix angustata rotundata vel truncata, nervis paucis obscuris, marginibus integris. *Flores* ramulos terminantes, circiter 3·5 mm. longi. *Pedicelli* 1–2 mm. longi. *Sepala* supra basim affixa, 5, ovato-lanceolata, in lobum brevem rotundatum producta, 3·5–4 mm. longa, obtusa, glabra, viridia. *Petala* 5, unguiculata, lanceolata, sepalis circiter quadrante minora, obtusa, superne hyalina, unguem lato in basim dilatato brunnescente. *Squamae hypogynae* ut videtur nullae. *Stamina* 8, 2–2·5 mm. longa; filamenta gracilia, filiformia, hyalina; antherae parvae, cordato-rotundatae, luteae. *Gynaecium* e carpellis 5 inferne connatis constans; ovaria latere visa late ovato-oblonga, apice rotundata; styli breves, crassiusculi; stigmata minute lobata. *Fructus* e folliculis 5 constans; folliculi apice rotundati, stylis persistentibus coronati. *Semina* pro folliculo circiter 10, suboblonga, apicem versus leviter sensim angustata, minutissime muricata, haud 1 mm. longa.

India. Garhwal, Kalajowar, 15000 ft., *R. Strachey* and *J. E. Winterbottom* 5; Kumaon, Nipchang Valley, 13000–14000 ft. 31 Aug. 1884, *J. F. Duthie* 2920 (type).

The plant found by Strachey and Winterbottom between the years 1846 and 1849 in Garhwal (represented by 3 fragments in the Kew Herbarium) was cited in the Journ. Linn. Soc. Bot. ii. 103: 1858, under *S. perpusillum* Hook. f. & Thoms., which was based primarily on specimens collected by Sir J. D. Hooker in Sikkim. But C. B. Clarke in the Fl. Brit. Ind. ii, 442; 1878, remarked of the first mentioned plant, "The specimen referred here by H. f. & T. collected in the Western Himalaya has different seeds; it is in too imperfect a state for identification." In 1884 Duthie found a *Sedum* in a neighbouring locality which he named as quoted above but, unfortunately, he did not carry out his intention of publishing a description. I have no doubt of the identity of Duthie's plant with that of Strachey and Winterbottom, both from the Western Himalayas, nor of its being quite distinct from Hooker's species from the Eastern Himalayas.

1146. **Rumfordia spectabilis** *Sandwith* [Compositae-Helianthoideae]; *R. floribundae* DC. affinis, omnibus partibus suis majoribus vel numerosioribus, praesertim bracteis squamisque involucri exterioribus non obovatis plerumque plusduplo majoribus differt.

Herba verisimillime elata, speciosa, caule sub panicula subligneso glabro 4 mm. diametro. *Folia* opposita, glabra, late rhomboideo-ovata, acuminata, leviter dentata, cum forma omnino eadem ac in *R. floribunda*, sed majora, ea ramos paniculae infimos subtendentia 25 cm. longa, 13–14 cm. lata, superiora minora et in bracteas decrescentia, ut in *R. floribunda* abrupte velut in petiolum contracta, deinde cuneata et basi distincte connata, 8 cm. supra basim conspicue trinervia. *Panicula* ovoidea, 12–20 cm. diametro, composita, multicapitulata oppositiramea, ramis dense glanduloso-pubescentibus; bracteae numerosae, conspicuae, glandulosae, primariae foliaceae, secundariae ellipticae vel ovato-lanceolatae, 1–2 cm. longae, 3–8 mm. latae, internodia ramorum pedicellosque saepe aequantes. *Capitula* speciosa, ad 4·5 cm. diametro, pedicellos 1–2·8 cm. longos terminantia. *Involucri* squamae exteriores 5, utrinque glandulosae, ovato-ellipticae vel ovato-spathulatae, obtusae vel fere acutae neque ut in *R. floribunda* obovatae, striato-venosae, integrae, 1–1·6 cm. longae, 4–9 mm. latae; squamae interiores cucullato-cymbiformes, acutiusculae, dorso glanduloso-scaberrimae, 4–5 mm. longae. *Flores disci* ad 25, tubo glanduloso-pubescenti 2 mm. longo, faucibus 4–5 mm. longis. *Flores* ♀ 7–10; tubus glanduloso-pubescens 2·5 mm. longus; ligula late elliptica, siccitate candidissima, striato-venosa, 1·6–1·8 cm. longa, 10–12 mm. lata, apice obtuse breviterque tridentata. *Achaenia* ut in *R. floribunda*.

Mexico. Sinaloa; Rio Los Carrizos, 1940 m., *Gonzalez Ortega* 966 (type in Herb. Kew.).

Vernacular name: Tacote.

Though the characters which separate this on paper from *R. floribunda* are mainly those of degree, they are so numerous and so considerable that the plant is distinguished at a glance from a large and uniform series of the common species, and seems to deserve nothing less than specific rank.

1147. **Polycline Haareri** *Dandy* [Compositae]; ob folia sessilia, lanceolato-ovata, grosse obtuseque dentata, e basi 3-nervia, facile distinguenda.

Herba ad 30 cm. alta, glaberrima, basi lignosa, parce ramosa, ramis erectis subteretibus sed leviter crebreque costatis. *Folia* sessilia, lanceolato-ovata, grosse dentata, dentibus obtusis utrinsecus 3–6, superiora fere integra, basi late cuneata obtusa, apice obtusa, membranacea, concoloria, e basi 3-nervia, 2–2·5 cm. longa et 1–1·4 cm. lata, superiora minora. *Glomeruli* 20–30-capitulati, 1·3–1·5 cm. diametro, pedunculati, pedunculis 2–4 cm. longis leviter costatis; receptaculum commune conicum. *Capitula* circiter 15–20-flora, globosa; receptaculum verum subulatum; capitulorum exteriorum bracteae ad 5 mm., eaedem capitulorum caeterorum et receptaculi paleae circiter 3·5 mm. longae, omnes concavae, oblongae, obtusae, hyalinae, 1-nerviae, apicem versus breviter fimbriatae. *Corolla* alba, 2–2·5 mm. longa, regulariter

5-loba, lobis triangularibus acutis recurvis, tubo superne dilatato. *Antherae* circiter 1·4 mm. longae, basi caudatae. *Achaenia* nigra, obovoideo-oblonga, leviter compressa, basi brevissime stipitata, circiter 1 mm. longa, minute verruculosa et sparse brevissimeque pilosula.

Tropical Africa. Tanganyika Territory: Doinyo Sambu, Arusha, approximately 1800 m. alt., Feb., *Haarer* B 150.

1148. **Petrocosmea Parryorum** *C. E. C. Fischer* [Gesneraceae-Cyrtandreae]; *P. grandiflorae* Hemsl. affinis, foliis peltatis, floribus minoribus differt.

Herba parva, primo dense sericeo-hirsuta. *Cormus* radiculis fibrosis provisus. *Folia* rosulata, primo subcarnosa et bullata, tandema membranacea planaque, peltata, variabilia, ad 6 cm. longa, limbo orbiculari paullo oblato anguste vel lato elliptico ad 3 cm. lato apice rotundato vel rarius subacuto basi rotundato subpalmate nervoso supra penninervio, costa lata nervis secundariis obscuris primo praecipue subtus dense hirsuto, tandem hirtis albis crispis utrinque sparse tecto, supra primo papilloso siccitate areolato, integro repando vel paullo sinuato-dentato, margine ciliato. *Petioli* pedunculi pedicilli calycesque ut folia hirti. *Pedunculi* 1-pauciflori ex apice cormi, foliis in flore aequantes, in fructu superantes. *Flores* solitarii vel in umbellis simplicibus compositisve collecti. *Pedicelli* in flore 1–2 cm. longi apice bracteis lineari vel lineari-lanceolata calyce breviore provisi. *Calyx* profunde 5-fidus, laciniis aequalibus lanceolatis acutis. *Corolla* late campanulata, intense coerulea, delicate venosa, intus pubescens extus glaber, 1·3–1·5 cm. diametro tubo brevi; labium anticum 3-lobum lobis latis rotundatis; posticum 2-lobum lobis angustioribus muticis. *Discus* 0. *Stamina* 2, inclusa, filamentis crassis geniculatis apice incrassatis rufo-villosis basi glabris 1·5–2 mm. longis. *Antherae* ovato-cordatae, apice conniventes, 3 mm. longae. *Staminodia* 2 ligulata minuta. *Ovarium* albo-villosum. *Stylus* ovario longior, glaber, exsertus; stigma capitellatum, globosum, parvum. *Capsula* lineari-lanceolata, 1·3–2 cm. longa, 4–6 mm. lata, valvis corneis, acutis. *Semina* fusiformia, utrinque acuta, brunnea, laevia, 0·5 mm. longa.

India. Assam; Lushai Hills, about 1700 m., near Saiisuk, Muallung, on the Chin Hill border, and Vanlaiphai, Sept.–Nov. *Mr. and Mrs. N. E. Parry* (type in Herb. Kew.).

This is the first record of a *Petrocosmea* from India; of the 15 species described hitherto 14 are Chinese and 1 is from Siam.

This little plant grows gregariously, associated with Begonias, on moss covered rocks over which water trickles during part of the year; in winter it is subject to frost. Its habit and its brilliant flowers should make it an attractive recruit for the rock garden for which it is being tried for hardiness. The top of the corm and the bases of the petioles and peduncles are densely felted. One of the flowers received had 6 corolla lobes.

1149. **Drypetes (Hemicyclia) Kurziana** *C. E. C. Fischer* [Euphorbiaceae]; *D. andamanicae* (Kurz) Pax et K. Hoffm. affinis, ramulis hornotinis pubescentibus, foliis majoribus, petiolis supra noncanaliculatis, fructibus majoribus, putamine reticulationibus elevatis differt.

Arbor, ramuli hornotini minute fusco- vel flavo-pubescentes, demum glabri, pallido-brunnei. *Folia* lanceolata, obtuse acuminata, apiculata, utrinque glabra, 7–14 cm. longa, 2–4 cm. lata, basi angustata, obliqua; costa supra subelevata, infra prominens, primo basi infra paullo pubescens, nerviis primariis 10–13 paribus, paullo irregularibus haud prominentibus margine anastomosantibus reticulationibus minutis indistinctis marginibus saepius crenato-serratis, crenaturis saepius minute nigro-mucronatis. *Petioli* 5–7 mm. longi, teretes paullo rugosi, primo fulvo-pubescentes, demum glabri. *Flores* axillares, solitarii vel bini. *Gemmae* ♂ globosae, ♀ ellipsoideae. *Pedicelli* ♂ circa 4 mm. longi, ♀ 4–5 mm. longi, fructu ad 1 cm. longi; ♂ et ♀ minute fulvo-pubescentes, basi bracteis 2–3 triangularibus, pubescentibus muniti. *Sepala* ♂ 4, libera, exteriora orbicularia, interiora suborbicularia vel orbiculato-spathulata, saepius concava, circa 3 mm. longa, breviter ciliata, utrinque minute pubescentia. *Discus* tenuis, planus, glaber. *Stamina* circa 28, glabra, circa 2·5 mm. longa; filamenta brevia; antherae oblongae, 4-locellata, basi lobulis 2, rotundatis. *Pistillodium* 0. *Sepala* ♀ 4, libera, ovato-oblonga vel spathulata, 5 mm. longa, extus pubescentia, intus villosa, apice rotundata. *Discus* annularis, carnosus, margine minute lobulatus. *Ovarium* ovatum, 2 mm. longum, glabrum, lateris basi sulcatum; stigmata 2, subsessilia, flabellata, glabra, supra papillosa. *Drupa* ellipsoidea, paullo compressa, 1·5 cm. longa, 0·9 cm. lata, 0·7 cm. crassa, pulpa intus fibrosa. *Putamen* osseum, compresso-ovatum, acutum basi rotundatum, drupa paullo minus, in dorso et lateribus reticulationibus elevatis ornatum, ventraliter obtuse rostratum, umbonatum, infra ad basin alte sulcatum; ab umbone spina (columella ?) in sulca ad basin recumbit. *Semen* compresso-ovatum, acutum, ventraliter bicarinatum, inter carinas late sulcatum.

Burma. Tharawaddy District, Old Athayan Reserve, "in swampy forests", March and April, *Range Officer* 3.

Vernacular Name: Leikyin.

The ovary is 1-celled with 2 pendant collateral ovules under a single obturator, but at the apex of the ovary shows signs of having

b *c* *a*

Putamen of *Drypetes Kurziana* Fisch.

a. dorsal aspect. b. ventral aspect showing the columella (?). c. side view. (All about natural size.)

a bi-locular origin. The curious spine on the ventral surface of the putamen seems to be the persistent columella of a 2–3 stoned fruit become one-stoned by abortion. Very young flowers are required to establish this point.

1150. **Pennisetum Basedowii** *Summerhayes et C. E. Hubbard* [Gramineae]; affinis *P. villoso* R. Br. a quo setis scaberulis tantum, exterioribus quam interioribus multo brevioribus, spiculis satis brevioribus, gluma superiore 10–11-nervia differt.

Basis ignota. *Culmi* ultra 30 cm. alti, teretes, infra inflorescentiam scaberuli, ceterum glabri, pauciramosi, 3-nodi, nodis glabris. *Foliorum vaginae* solutae, internodiis breviores, compressae, glabrae, laeves; ligulae truncatae, 0·5 mm. longae, ciliatae; laminae lineares, longe attenuatae, acutae vel acutissimae, apice callosae, 12–17 cm. longae, 3–6·5 mm. latae, conduplicatae, utrinque glabrae, marginibus scaberulis. *Inflorescentia* spiciforma, cum setis 5·5–7 cm. longa, circiter 6 cm. lata, densa, pallide straminea; rhachis angulata, angulis scabrido-ciliatis; pedicelli brevissimi, 0·75 mm. longi, pilis brevissimis sericeis albidis dense induti; involucri setae numerosae, exteriores breviores, 0·5–18 (saepissime 6–8) mm. longae, filiformes, minute scaberulae, interiores saepe 4, 2·5–3·5 cm. longae, a basi ad 8 mm. sursum sensim attenuatae, superne filiformes, scaberulae. *Spiculae* solitariae, lanceolatae, acuminatae, 6·5–6·8 mm. longae, pallidae, a uno latere suffuso-purpureae. *Gluma* inferior deest; gluma superior ovata, acuminata, 6·5 mm. longa, 10–11 nervia, nervis parallelis anastomosantibus, subhyalina, apice scaberula. *Anthoecium inferum* ad lemma reductum; lemma ovatum, acuminatum, 6·5–6·8 mm. longum, 7-nervium, subhyalinum, apice scaberulum. *Anthoecium superum* ♀; lemma lanceolatum, acuminatum, 6 mm. longum, 5-nervium, subchartaceum, marginibus subhyalinis, minute obscureque rugulosum, apice scaberulum; palea lemmati similis, sed angustior, apice minute bifida. *Antherae* non visae. *Styli* basi breviter connati, superne liberi, stigmata ab apice spiculae exserta. *Caryopsis* oblonga, 2 mm. longa, albido-lutea.

Western Australia. May River, King Sound, Apr., *Basedow* 13. N.W.

LV.—NOTES ON AFRICAN GRASSES: III.*

New Species of **Melinis** Beauv.

M. mollis *Stapf et Hubbard*, sp. nov.; affinis *M. Goetzenii* Mez, sed spiculis minoribus, gluma superiore ad carinam et lemmate ad margines longe hirsutis, praeterea glabris, foliis mollissime hirsutis differt.

Gramen perenne. *Culmi* vagantes, e basi decumbente ascendentes, ad 1·2 m. alti, teretes, graciles, inferne molliter pilosi et

* Continued from *Kew Bull.*, 1926, p. 368.

tuberculati, paniculam versus glabri et laeves, multiramosi, multinodi, nodis pilosis. *Folia* breviter et molliter pubescentia vel pilosa, tenuiter tuberculata. *Vaginae* inferne solutae, superne arctae, tenuiter striatae. *Ligulae* ad seriem ciliarum reductae, pilis ad 1 mm. longis. *Laminae* lineares, tenuiter acutae, 8–12 cm. longae, 4–6 mm. latae, marginibus asperulis breviterque ciliatis. *Panicula* 11–17·5 cm. longa, linearis, e vagina summa longe exserta, omnibus partibus minute scaberula; rhachis teres, gracilis, tenuiter striata; rami 2–3-nati, erecti vel leviter patentes; ramuli et pedicelli flexuosi; pedicelli inaequales, 0·5–3·5 mm. longi, infra apicem leviter incrassatum pilis brevibus paucis argenteo-nitentibus muniti. *Spiculae* oblongae, 3 mm. longae, inferne virides, superne purpureo-suffusae, sparse pilosae, tenuiter nervosae. *Gluma inferior* ovata, obtusa, 0·1 mm. longa, glabra, enervia; gluma superior 3 mm. longa, ovato-oblonga, 2-loba, lobis obtusis 0·4–0·5 mm. longis, arista gracili stricta ad 2 mm. longa e sinu instructa, tenuiter membranacea, carina pilis densis ad 3 mm. longis albis vel purpureo-suffusis e tuberculis minutis longe pilosa, 6–7-nervia, nervis anastomosantibus. *Anthoecium inferum* sterile; lemma 3 mm. longum, anguste ovato-oblongum, 2-lobum, lobis tenuiter acutis 0·75 mm. longis, e sinu arista flexuosa purpurea ad 9 mm. longa instructa, marginibus longe pilosum, 5-nervium; palea linearis, 1·5 mm. longa, minute bifida, carinis minute scaberulis. *Anthoecium superum* ♀; lemma ovatum, 2 mm. longum, minute bifidum, obscure 3-nervium, palea paulo brevior et angustior.

Tropical Africa. Angola: Cuanza Norte, Cassoalala, near the river Lukala, 40 m., *Gossweiler* 8925.

M. Eylesii *Stapf et Hubbard*, sp. nov.; affinis *M. ambiguae* Hack., sed spiculis breviter hirsutis et foliis mollissime diu tomentosis differt.

Gramen perenne. *Culmi* laxe caespitosi, erecti vel ascendentes, 1–1·2 m. longi, teretes, graciles, firmi, pubescentes vel pilosi, pilis erectis patulis vel reflexis albis, paniculam versus glabri, multinodi, nodis villosis. *Foliorum vaginae* inferiores subpersistentes, arctae, internodiis breviores, superiores laxiores, internodiis longiores, tenuiter striatae, minute tuberculatae, pubescentes vel pilosae vel summae glabrae; nodi villosi. *Ligulae* ad seriem ciliarum reductae, pilis ad 1 mm. longis. *Laminae* lineares, longe et tenuiter acutae, 7·5–15 cm. longae, 5–6 mm. latae, planae, utrinque molliter tomentosae, ad margines pilis e tuberculis ortis sparse fimbriatae et ciliolatae. *Panicula* linearis, 15–18 cm. longa, contracta, purpurascens, omnibus partibus minute et obscure scaberula; rami erecti, 1–3-nati, tenues; ramuli et pedicelli flexuosi, capillares; pedicelli 1–3 mm. longi, infra apicem leviter incrassatum pilis 0·5–1 mm. longis argenteo-nitentibus muniti. *Spiculae* oblongae, 2·5–2·7 mm. longae, breviter et sparse pilosae. *Gluma inferior* ovata, acuta vel obtusa, 0·4–0·5 mm. longa, obscure 1-nervia vel enervia, glabra, hyalina;

gluma superior late oblonga, spiculam aequans, 2-loba, lobis obtusis glabris circiter 0·6 mm. longis, arista flexuosa viridi 4–6 mm. longa e sinu instructa, membranacea, versus margines sparse pilosa pilis albis brevibus, 7-nervia. *Anthoecium inferum* sterile; lemma anguste oblongum 2 mm. longum, 2-lobum, lobis acutis 0·6 mm. longis, e sinu arista tenui flexuosa 8–10 mm. longa instructum, tenuiter 5-nervium, versus margines sparse pilosum; palea 0. *Anthoecium superum* ♀; lemma ovatum, obtusum, 2 mm. longum, obscure 3-nervium, minute bifidum, palea similis. Tropical Africa. Rhodesia: Salisbury, 1500–1560 m., common among rocks, *Eyles* 2276 (type); Marandellas, 1500 m., *Eyles* 1635.

M. pallida *Stapf et Hubbard*, sp. nov.; affinis *M. Eylesii* Stapf et Hubbard, sed spiculis glabris et nervis glumae superioris anastomosantibus differt.

Gramen perenne. *Culmi* 90–120 cm. longi, e rhizomate brevi orti, teretes, tenuiter striati, pubescentes vel pilosi, pilis adpressis vel patulis, paniculam versus sparse pubescentes vel glabri laevesque, multinodi, nodis villosis. *Foliorum vaginae* solutae, tenuiter striatae et tuberculatae, plerumque internodiis breviores, pubescentes vel pilosae. *Ligulae* ad seriem ciliarum reductae, pilis 0·6 mm. longis. *Laminae* lineares, longe et tenuiter acutae, 7–15 cm. longae, 5–7 mm. latae, planae, supra glabrae vel sparse pubescentes et infra pilis debilibus albis e tuberculis minutis indutae, ad margines tuberculis ciliolisque asperulae. *Panicula* ad 20 cm. longa, anguste oblonga, moderate laxa; rhachis laevis, tenuiter striata, gracilis; rami erecti, 2-nati, laeves; ramuli et pedicelli minute puberuli, capillares, flexuosi; pedicelli 0·5–2 mm. longi, glabri. *Spiculae* oblongae, 2·5 mm. longae, glabrae, pallidae, sursum versus purpurascentes, tenuiter nervosae. *Gluma inferior* ovata, obtusa, 0·3 mm. longa, enervia, hyalina; gluma superior ovato-oblonga, spiculam aequans, breviter 2-loba, lobis latis ovatis obtusis 0·6 mm. longis, e sinu arista gracili ad 4 mm. longa instructa, tenuiter membranacea, 7-nervia, nervis anastomosantibus. *Anthoecium inferum* sterile; lemma anguste oblongum, glumae superiori simile, sed brevius, 5-nervium, 2-lobum, lobis tenuiter acutis 0·8 mm. longis, e sinu arista flexuosa 10–12 mm. longa instructum; palea 0. *Anthoecium superum* ♀; lemma ovatum, 1·5 mm. longum, bifidum, obscure 3-nervium; palea lemmati similis. *Antherae* lineares, circiter 2 mm. longae.
Tropical Africa. Angola: Huilla, Mounyino, forest glades, 1760 m., *Dekindt* 419 (type in Herb. Berol.).

M. biaristata *Stapf et Hubbard*, sp. nov.; affinis *M. pallidae* Stapf et Hubbard, sed gramen annuum, spiculis breviter hirsutis, nervis glumae superioris non anastomosantibus differt.

Gramen annuum. *Culmi* ascendentes, ad 90 cm. alti, graciles, inferne asperuli et hirsuti, praeterea glabri, multinodi, nodis villosis. *Foliorum vaginae* solutae, leviter striatae, tuberculatae

et hirsutae, leviter viscosae. *Laminae* lineares, longe et tenuiter acutae, 7–14 cm. longae, 5–6 mm. latae, planae, utrinque hirsutae et tuberculatae, marginibus ciliolatis. *Panicula* ad 18 cm. longa; ramuli et pedicelli capillares, flexuosi; pedicelli ad 4 mm. longi, infra apicem pilis brevibus paucis argenteo-nitentibus muniti. *Spiculae* lineari-oblongae, 2·5–3·3 mm. longae, sursum versus sparse et obscure hirsutae. *Gluma inferior* ovata, obtusa, minuta, glabra, hyalina, enervia; gluma superior ovato-oblonga, spiculam aequans, 2-loba, lobis late acutis glabris 0·6–0·8 mm. longis, e sinu arista purpurea 3 mm. longa instructa, tenuiter membranacea, tenuiter 7-nervia, sursum versus sparse et breviter hirsuta. *Anthoecium inferum* sterile; lemma anguste ovato-oblongum, 2·3 mm. longum, tenuiter 5-nervium, 2-lobum, lobis longe et tenuiter acutis 0·8 mm. longis, e sinu arista gracili flexuosa purpurea ad 24 mm. longa instructum; palea 0. *Anthoecium superum* ♀; lemma ovatum, circiter 2 mm. longum, minute bifidum, palea leviter longior.—*M. minutiflora* var. *biaristata* Rendle in Cat. Afr. Pl. Welw. ii. 200.

Tropical Africa. Angola: Pungo Andongo, sandy thickets near the edges of woods near the Quilanga road, *Welwitsch* 2830.

M. macrochaeta *Stapf et Hubbard*, sp. nov.; affinis *M. tenuinervi* Stapf, sed gramen annuum, spiculis molliter membranaceis nec inter nervos sulcatis differt.

Gramen annuum. *Culmi* ad 1·2 m. alti, erecti vel ascendentes, teretes, graciles vel validi, firmi, glabri laevesque vel sparse hirsuti et tuberculati, multinodi, nodis pilosis, simplices vel sparse ramosi. *Foliorum vaginae* arctae vel solutae, tenuiter striatae, sparse pilosae, dense et tenuiter tuberculatae. *Ligulae* ad seriem brevem ciliarum reductae. *Laminae* lineares vel lineari-lanceolatae, longe et tenuiter acutae, 5–20 cm. longae, 6–14 mm. latae, tenuiter nervosae, supra sparse hirsutae, infra hirsutae et tuberculatae. *Panicula* ex anguste oblongo ad late ovatum vergens, effusa vel contracta, densa vel laxa, 7·5–20 cm. longa, 1·5–7·5 cm. lata; rhachis tenuiter striata, teres, gracilis, laevis vel minute puberula; rami erecti vel patuli, 2–3-nati; ramuli et pedicelli capillares, flexuosi, purpurascentes, minute scaberuli; pedicelli 0·5–2 mm. longi, glabri. *Spiculae* lineari-vel ovato-oblongae, 1·5–2 mm. longae, glabrae aut sparse vel dense pilosae pilis brevibus mollibus albis. *Gluma inferior* ad marginem minutam hyalinam angustam reducta; gluma superior late ovato-oblonga, spiculam aequans, 2-loba, lobis denticulatis vel integris (raro), glabra vel pilosa, 7-nervia. *Anthoecium inferum* sterile; lemma anguste oblongum, glumae superiore simile; 2-lobum, lobis tenuiter acutis circiter 0·6 mm. longis, e sinu arista tenui flexuosa 10–20 mm. longa instructum, 3–5 (raro)-nervium; palea 0. *Anthoecium superum* ♀; lemma ovato-oblongum, circiter 1·3 mm. longum, minute bifidum, obscure 3-nervium, hyalinum; palea quam lemma paulo longior et latior. *Antherae* 1–1·3 mm. longae.—*M. minutiflora*

Rendle in Cat. Afr. Pl. Welw. ii. 199. Durand et Schinz Consp. Fl. Afr. v. 735 (p.p.). K. Schum. in Engl. Pflanz. Ost. Afrik. C.99 (p.p.). Pilger in Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo. Exped. ii. 199; non Beauv.

Tropical Africa. N. Nigeria: Lely 785 (type). Belgian Congo: Elisabethville, *Rogers* 10990, 10998, 10902. Angola: Benguella, *Gossweiler* 3930; Golungo Alto, *Welwitsch* 2992. Tanganyika Territory: Ungoni, Kwa-Kihingi, *Busse* 743. Rhodesia: Salisbury, *Eyles* 2240, 2266, 3396; Bangweolo, *Fries* 951a.

M. effusa *Stapf* in Kew Bull. 1922, 310 (nomen); affinis *M. tenuissimae* Stapf, sed laminis hirsutis glanduloso-viscosis, rhachi paniculae minute scaberula, gluma superiore 7-nervia differt.

Gramen perenne, viscosum. *Culmi* erecti vel e rhizomate breve ascendentes, ad 1 m. alti, teretes, tenues, glabri et laeves vel sparse hirsuti, ramosi, multinodi, nodis pilosis vel villosis. *Folia* dense vel sparse pubescentia vel pilosa, tenuiter tuberculata. *Vaginae inferiores* arctae, tenuiter striatae, internodiis breviores, superiores longiores, laxiores. *Laminae* lineares vel lineari-lanceolatae, 6-13 cm. longae, 4–10 mm. latae, longe et tenuiter acutae, infra glaucae, marginibus scaberulis et sparse vel dense fimbriatis, pilis e tuberculis ortis. *Panicula* e lineare ad ovato-oblongum vergens, 9–23 cm. longa, 2·5–5 cm. lata, effusa, flexuosa, purpurascens, omnibus partibus minute scaberulis; rhachis gracilis, tenuiter striata; rami ascendentes, 2–3-nati, tenues; ramuli et pedicelli capillares, flexuosi; pedicelli 0·6–3 mm. longi, infra apicem leviter incrassatum pilis ad 2 mm. longis argenteo-nitentibus muniti. *Spiculae* ovato-oblongae, 1·5–1·75 mm. longae, fere glabrae, purpurascentes, delicate nervosae. *Gluma inferior* ovata vel ovato-oblonga, obtusa, ad 0·3 mm. longa, hyalina, enervia vel ad marginem angustam reducta, e callo minute hirsuta; gluma superior late ovato-oblonga, spiculam aequans, 2-loba, lobis obtusis 0·3 mm. longis, breviter mucronata vel emucronata, molliter membranacea, superne marginibus ciliolatis et interdum prope apicem pilis paucis induta, 7-nervia. *Anthoecium inferum* sterile; lemma ovato-oblongum, glumae superiori simile, 5-nervium, 2-lobum, lobis acutis 0·5 mm. longis, e sinu arista flexuosa purpurascente 6–8 mm. longa instructum; palea 0. *Anthoecium superum* ♀; lemma ovato-oblongum, circiter 1 mm. longum, obscure 1–3-nervium, hyalinum, minute bifidum; palea lemma subaequans, sed latior et truncata.—*M. minutiflora* var. *effusa* Rendle in Cat. Afr. Pl. Welw. ii. 200 (p.p.).

Tropical Africa. Angola: Golungo Alto, in poor soil in sunny places near Cambondo, *Welwitsch* 2958.

M. purpurea *Stapf et Hubbard*, sp. nov.; affinis *M. tenuinervi* Stapf, sed culmis gracilibus, panicula angustiore, spicularum aristis brevioribus differt.

Gramen perenne. *Culmi* e basi multinoda ramosa prostrata ascendentes, 2–3-foliati, 30–60 cm. longi, teretes, graciles, glabri, purpurascentes, 1–3-nodi, nodis pilosis; innovationes densius foliatae, breves. *Folia* laxe pilosa vel tomentosa, tenuiter tuberculata. *Vaginae inferiores* breves, densae, imbricatae, superiores longae, arctae, tenuiter striatae, internodiis breviores. *Ligulae* ad seriem albarum ciliarum reducta, pilis ad 1 mm. longis. *Laminae* lineares vel lineari-subulatae, tenuiter acutae, 1·25–5 cm. longae, 2–4 mm. latae, firmae, rigidae, planae vel involutae. *Panicula* 5–10 cm. longa, 0·75–1·25 cm. lata, linearis, densa, erecta, atro-purpurascens, undique minute scaberula; rhachis gracilis, teres, tenuiter striata; rami 2–3-nati, erecti; ramuli et pedicelli flexuosi, capillares; pedicelli 0·5–2 mm. longi, glabri. *Spiculae* lineari- vel lanceolato-oblongae, circiter 2 mm. longae, tenuiter sulcatae et nervosae, breviter pilosae. *Gluma inferior* 0·4 mm. longa, ovata, obtusa, enervia, glabra; gluma superior oblonga, spiculam aequans, 2-loba, lobis latis rotundato-obtusis glabris 0·4 mm. longis, breviter mucronata, membranacea, pilosa, pilis brevibus mollibus albis, 7-nervia. *Anthoecium inferum* sterile; lemma anguste oblongum, gluma superiori simile, 5-nervium, 2-lobum, lobis angusti sacutis circiter 0·6 mm. longis, e sinu arista 2–6 mm. longa instructum; palea 0. *Anthoecium inferum* ♀; lemma ovato-oblongum, 1·5–1·75 mm. longum, hyalinum, obscure 1–3-nervium, minute bifidum; palea lemmati similis.
Tropical Africa. Tanganyika Territory: Rungwe Mt., eastern flank, near Muakaleli, 1600 m., *Stolz* 1341.

M. Maitlandii *Stapf et Hubbard*, sp. nov.; affinis *M. tenuinervi* Stapf, sed spiculis superne longe hirsutis (pilis apicem 1 mm. superantibus), praeterea callo breviter hirsuto differt.

Gramen perenne. *Culmi* erecti vel ascendentes, 60–70 cm. longi, moderate validi, teretes, glabri, multinodi. *Folia* sparse vel dense hirsuta pilis e tuberculis induta. *Vaginae* solutae, imbricatae, tenuiter striatae, nodis barbatis. *Ligulae* ad seriem albarum ciliarum reductae, pilis ad 1 mm. longis. *Laminae* lineares, longe et tenuiter acutae, 7·5–15 cm. longae, 6–8 mm. latae, superiores breviores et angustiores, firmae, planae raro involutae, marginibus asperulis ciliolatisque. *Panicula* linearioblonga, 12·5–20 cm. longa, 1·25–2.25 cm. lata, erecta, densa, flavo-viridis, purpurea aut viridi-purpureo variegata; rami 2–3-nati, erecti; ramuli et pedicelli flexuosi, capillares, minute et obscure scaberuli; pedicelli 1–2 mm. longi, glabri. *Spiculae* lineari-oblongae, circiter 2 mm. longae, prominenter nervosae et sulcatae, superne longe pilosae. *Gluma inferior* ad marginem angustam reducta vel ovata, obtusa aut acuta, hyalina, ad 0·25 mm. longa, enervia, e callo hirsuta, pilis ad 1 mm. longis; gluma superior oblonga, spiculam aequans, 2-loba, lobis brevibus rotundatis, mucronata vel emucronata, membranacea, glabra vel inferne ad margines hirsuta, superne sparse pilosa, pilis longis albis apicem 1 mm. superantibus, 7-nervia. *Anthoecium inferum* sterile; lemma

anguste oblongum, glumae superiori simile, 2-lobum, lobis angustis acutis 0·4 mm. longis, e sinu arista stricta vel flexuosa 6–12 mm. longa instructum, 5-nervium; palea 0. *Anthoecium superum* ♀; lemma ovato-oblongum, 1·2–1·6 mm. longum, obscure 1–3-nervia, hyalinum, minute bifidum; palea lemmati similis. *Antherae* lineari-oblongae, 1·2 mm. longae.

Tropical Africa. Uganda: Bufumira Islands, Sesse, 1100 m., in open-growing glades near forest, *Maitland* 360 (type). Nyasaland: Nyika Plateau, 1800–2100 m., *Whyte*.

LVI.—CONTRIBUTIONS TO THE FLORA OF BURMA.

C. E. C. Fischer.

The present paper mainly deals with a collection made in January and February, 1926, in South Tenasserim by Mr. C. E. Parkinson, Forest Botanist, Burma. In addition some of the plants described were obtained by Mr. Parkinson in North Burma and some gathered in Tavoy by Mr. R. N. Parker, Imperial Forest Botanist for India. All the specimens mentioned are in the Herbarium, Royal Botanic Gardens, Kew.

Tenasserim, which forms the southernmost division of Burma, runs in a narrow tongue down to the Malay Peninsula and occupies, in one part where it is separated from the Kingdom of Siam by the Bilaukataung Mountain Range, the greater width between the Indian Ocean and the Gulf of Siam. It includes the ceded Provinces of Mergui and Tavoy, which, together with the Districts of Amherst, Shwe-gyeng, Toung-ngu and the Salween Hill Tracts, make up the Tenasserim Division.

With the exception of a considerable portion of the Amherst District, the whole of Tenasserim is mountainous and sparsely populated and cultivated, the greater part being covered with dense, often evergreen, and mostly virgin, forest. It is an interesting area from the botanical point of view as it is the meeting place of the Indian and Malayan Floras and also because it has been comparatively little explored. Its backward condition and the lack of means of easy communication account for this. A large proportion of the area has never been exploited, even for timber, so that practically no opening up of the remoter tracts has taken place. So much is this the fact that in 1925 it was found advisable to undertake an aerial reconnaissance of a large area of forest in order to arrive at some knowledge of the configuration and the constitution of the forests, this method, in the absence of means of communication and facilities for camping, being the cheapest and most expeditious.

In these circumstances it is not surprising to find that a considerable proportion of the species represented in the collections under review are new, and also that others have been obtained previously only from Malaya or Siam. It is highly probable that further exploration will yield many more new species, and the

time when anything like a full survey of the flora of Tenasserim is possible is far distant.

Until quite recent years botanical collections were confined almost entirely to the coastal tracts and to the immediate vicinity of rivers at no great distance from the sea. It will be not without interest to mention the botanists who are known to have collected in the region. Besides professional botanists and collectors the list, during later years at least, includes Forest Officers who have managed to collect in the course of official tours, as well as those who have been on special forest botanical duty like Mr. Parker and Mr. Parkinson. The following list has been compiled very largely from the labels on the specimens in the Kew Herbarium and in many cases the dates have been obtained from the same source. The names are arranged in chronological order of collecting or of residence in Tenasserim.

Dr. W. Carey. A missionary resident in Burma and India from 1794 to 1834. Apparently collected for Wallich, Roxburgh and Wight.

Dr. N. Wallich. Superintendent of the Royal Botanic Garden, Calcutta. Collected along the Salween and Attaran Rivers and in the neighbourhood of Moulmein in 1827 when on deputation to inspect and report on the teak forests of the newly acquired tracts.

Gomez. 1827. Deputed by Wallich.

Rev. Francis Mason. A missionary in Burma from 1830 to 1874. Author of a work entitled "Burma."

William Griffith. Stationed in Tenasserim in 1833 and 1834.

Dr. Helfer. 1836. When deputed to report on the forests.

T. Lobb. 1847. Collected for Veitch.

Dr. Hugh Falconer. Superintendent of the Royal Botanic Garden, Calcutta. Collected in 1849 when deputed to report on the teak forests.

Dr. J. MacClelland. In charge of the forests from 1852 to 1855.

Rev. C. S. P. Parish. Chaplain in Burma from 1852 to 1878.

Dr. (later Sir) D. Brandis. Forest Service. 1856 to 1880.

Dr. H. Cleghorn. Date? While on a visit from Madras, where he was Conservator of Forests from 1856 to about 1870.

S. Kurz. Curator, Royal Botanic Garden, Calcutta, and author of "Forest Flora of British Burma." 1871 and 1872.

Col. Scott. 1867.

A. C. Maingay. 1869.

F. Stoliczka. An officer of the Geological Department. 1869.

G. Gallatly. Deputed for collecting from the Royal Botanic Garden, Calcutta, in 1877.

Col. R. Beddome. 1879. Apparently when on a short visit from Madras, probably to get some knowledge of the Burma teak forests.

1884 and 1885. Unnamed collectors deputed from the Royal Botanic Garden, Calcutta.

T. H. Aplin. 1888.

R. L. Proudlock. 1892.

Shaik Mokim. 1900. Deputed from the Royal Botanic Garden, Calcutta.

W. H. Craddock. 1901. Civil Service.

F. B. Manson. 1905. Forest Service.

J. H. Lace. 1908 to 1913. Forest Service.

W. A. Robertson. 1911. Forest Service.

A. Meebold. 1911. A travelling botanical explorer.

E. M. Buchanan. 1912. Forest Service.

D. P. Hewett. 1912. Forest Service.

R. N. Parker. 1925. Forest Service, Imperial Forest Botanist for India, Dehra Dun.

C. W. Scott. 1925. Forest Service, presumably when in charge of the aerial forest survey referred to above.

C. E. Parkinson. 1925 and 1926. Forest Service, Forest Botanist, Burma.

Special mention should be made of the excellent botanical work of the indefatigable collector, J. H. Lace, at one time Inspector General of Forests, who collected in many parts of Burma and India and added very much to the knowledge of the flora of those regions.

Artabotrys siamensis *Miq.* [Anonaceae].

A climber previously known only from Siam.

South Tenasserim. Mai nam wat, Theinkun chaung, 400 ft., Feb., *C. E. Parkinson* 1907.

Desmos caudatus *Fischer* [Anonaceae]; *D. chinensi* (Lour.) Saff. affinis, foliis caudatis, floribus axillaribus minoribus, pedunculis minoribus, sepalis et petalis hirsutis differt.

Tree up to 30 feet high; young twigs covered with longish, more or less appressed, and short, patent, brown hairs; branchlets glabrescent, the longer hairs disappearing first, grey, shallowly furrowed. *Leaves* narrowly to broadly elliptic, bluntly caudate, narrowed to the base, 7–11 cm. long, 2·2–4 cm. wide, caudicle 0·8–1·3 cm. long, brownish when dry, glabrous above except the pubescent midrib even when young, with appressed long and patent short hairs on the nerves beneath and sparingly also on the surface between, midrib channelled above, prominent below, primary nerves 6–9, impressed above, prominent below, slightly curved, anastomosing a short distance from the margin in one or two loops, secondary nerves transverse, indistinct. *Petioles* terete, 2–4 mm. long, indumentum as on the nerves beneath. *Flowers* solitary, axillary; peduncle 2–3 mm. long, curved, hairy with one or two small triangular hairy bracts near the base, pale-yellow. *Sepals* 3, free, broadly ovate, obtuse, about 3 mm. long, strongly ciliate and strigose on both faces with stiff grey or brownish appressed hairs, obscurely veined. *Petals* 6, subfleshy, the 3 outer linear, lanceolate, subacute, 2–4·2 cm. long, 5–8 mm. wide, ciliate-

hirsute with brownish hairs, which are long at the base and shorten upwards, the 3 inner petals a little shorter and narrower with similar indumentum, more fleshy and somewhat cupped at the base. *Stamens* mixed with brown, hairy scales, crowded, glabrous, wedge-shaped, 1·5–2·5 mm. long, about 1 mm. wide, the outer shorter and narrower, filament very short, stout, flattened, narrowed downwards, pale-brown, connective enlarged and concealing the anther from above, those of the central stamens more or less pentagonal truncate at the apex and with or without a minute cusp at each angle, those of the outer smaller and flat, with the anthers dark-brown and minutely punctate. *Carpels* about 5, linear, 2·5–3·5 mm. long, densely hirsute with stiff brown hairs; style globose, black, minutely pustular, sparsely hirsute with short brown hairs; ovules 6 in a single row. *Fruit* not seen.

South Tenasserim. Ngawun chaung forest, 300 ft., Jan., *C. E. Parkinson* 1633.

Desmos dumosa (*Roxb.*) *Saff.* [Anonaceae].

Previously reported from Assam and the Malay Peninsula. Forests near Tenasserim, 300 ft., Jan., *C. E. Parkinson* 1646.

Mitrephora vulpina *Fischer* [Anonaceae]; *M. Maingayo* Hook. f. affinis, foliis subtus ferrugineo-tomentosis, racemis longioribus, pedicellis longioribus, ovulis pluribus differt.

Tree 80–90 feet high; young parts ferruginous-tomentose, twigs glabrescent, grey. *Leaves* elliptic, elliptic-oblong, obovate-oblong or suborbicular, apex rounded, cuspidate or acutely acuminate, base rounded sometimes emarginate, 6–11 cm. long, 4–6·5 cm. wide, densely rusty-tomentose on both surfaces in youth, more especially on the nerves beneath, becoming quite glabrous and shining above, except the channelled midrib, permanently rusty-tomentose on the nerves below and more or less pubescent between, primary nerves 10–14 pairs, usually 12, distinct above, prominent below, ascending, usually regular and nearly straight to near the margin and then arching, but often forking or two adjacent ones uniting and perhaps again separating, nervules indistinct, ultimately finely reticulating, margin slightly revolute. *Petioles* channelled above, 5–8 mm. long, indumentum as of the undersurface of the blade. *Inflorescence* of extra-axillary racemes, 12 or more flowered, 3–6 cm. long, rhachis velvety, ferruginous at first, later brown, nodes close, somewhat swollen. *Flowers* about 3 cm. diam., pedicels 2–2·5 cm. long, enlarged upwards, ferruginous-tomentose, bearing a clasping, subacute bract, which is ferruginous-tomentose without and glabrous and veined within, about 5 mm. below the flower, 3–4 mm. long, 7–8 mm. wide. *Bud* reniform, nearly twice as broad as long, ferruginous tomentose. *Sepals* 3, shortly connate at the base, thick, subrotund, subacute, 5 mm. diam., shaggy with ferruginous hairs without, glabrous within. *Petals* 6, dark-purplish, 3 outer valvate in bud,

spreading in flower, obovate to oblanceolate, apex rounded or subacute, narrow or broad at base, 1·6–2 cm. long, ferruginous-hairy without, especially medially, glabrous on the lower half within and then increasingly ferruginous-pubescent towards the apex, margins entire, undulate or slightly erose, 3 inner petals inflexed over the stamens, vaulted and induplicate-valvate, early deciduous, broadly rhomboid with more or less acute angles, broadly clawed, about two-thirds the length of the outer petals; claws glabrous, more or less ferruginous-pubescent above, yellow with fine red streaks. *Stamens* crowded, connective flat, concealing the anthers. *Carpels* 16–20, mixed with brownish bristles, narrowing into the style, dotted with short bristles, especially near the apex; style short, somewhat angular, nearly as long as the carpel; ovules 8. *Fruit* not seen.

South Tenasserim. Naungbwa, Theinkun chaung, 200 ft., Feb., *C. E. Parkinson* 1698.

This species comes very near *M. Collinsae* Craib of which the flowers are unknown; it differs in the indumentum, which is shorter, more ferruginous, persistent on the underside of the leaves and less spread over the surface between the nerves; the nerves of the leaves are straighter; the inflorescence is longer and the flowers more numerous. It is not possible to compare the floral anatomy but dissection of very young buds of *M. Collinsae* seem to indicate that the shapes and proportions of the floral parts differ. Further material of the last-named species may possible necessitate the uniting of the two and, consequently, the disappearance of this specific name.

Mitrephora multiovulata *Fischer* [Anonaceae]; *M. reticulatae* Hook. f. & T. affinis, nervis foliorum paucioribus, floribus valde majoribus, ovulis valde pluribus differt.

Tree about 30 feet high; branchlets glabrous, dark-grey, irregularly furrowed, inner bark black; twigs slender, glabrous, light-brown, wrinkled when dry. *Leaves* membranous, lanceolate or elliptic, obtusely acuminate, base cuneate or rounded, 13–23 cm. long, 3·5–7 cm. wide, margins entire, midrib channelled above, prominent below, primary nerves 8–10 pairs, slender, distinct above when dry, subprominent below, arched and anastomosing in several loops a little within the margin, secondary nerves hardly less distinct, transverse, ultimate reticulations minute, glabrous above, with scattered hairs below, minutely pellucid-dotted. *Petioles* channelled above, about 5 mm. long, transversely rugose, dark-brown or nearly black, glabrous or with a few brownish or blackish hairs. *Inflorescence* in the axils of existing leaves or of fallen leaves on the branchlets; peduncle 2-flowered, usually solitary, 2–4 mm. long, tawny-pubescent, bearing 1 or 2 minute shaggy bracts and a larger one subtending the pedicels. *Flowers* monoecious; pedicels slender, 2–3 cm. long, whitish- or tawny-pubescent with a minute tawny, shaggy bracteole about the middle, rarely

a little below the flower. *Bud* depressed-globose, tawny-pubescent. *Sepals* 3, connate for about half their length, 3–4 mm. long, tawny-tomentose without, glabrous within, lobes semicircular, ciliate. *Petals* 6, 3 outer broadly ovate, subacute, valvate in bud, spreading in flower, about 1 cm. long, 0·75 cm. wide, thin, veined, gland-dotted, ciliate, greyish-pubescent without, glabrous within, white or pale-greenish; the 3 inner valvate, connivent over the torus, suborbicular with a narrow or broad claw half the total length, about 1·5 cm. long, more or less minutely tawny- or dark-pubescent and pustular without, less so within, thicker than the outer, purplish. *Torus* narrow, conical in bud, convex in flower, grey- or tawny-hairy. *Stamens* in the male flower crowded, connectives flat and concealing the anthers, in the female reduced to a very few imperfect ones. *Pistil* absent in the males, in the females consisting of about 8 ellipsoid, fuscous pubescent carpels about 3 mm. long, with sessile, peltate, more or less lobed, minutely pustulate, black stigmas; ovules 24 (always ?) in 2 rows. *Fruit* not seen.

South Tenasserim. Htahpe chaung, 300 ft., Jan., *C. E. Parkinson* 1617 (type); Mai nam wat, Theinkun chaung, 300 ft., Feb., *C. E. Parkinson* 1901.

Like *M. reticulata* Hook. f. & T., this species links *Orophea* and *Mitrephora*, having the few stamens in the female flower and the inner petals longer than the outer which are characteristic of the first genus, but having the numerous and uvarioid stamens in the male and the monoecious flowers of the second.

Sphaerocoryne Blanfordiana *Fischer* [Anonaceae]; *S. clavipedi* Craib affinis, foliis majoribus, pedunculis minoribus rufo-hirsutis, floribus oppositifoliis, petalis minoribus orbicularibus, staminibus angustioribus differt.

"A climber as thick as a man's arm" (Parkinson). *Branchlets* dark-brown, glabrous; twigs dark-brown, very shortly hairy in youth, more or less striate. *Leaves* subcoriaceous, elliptic or slightly oblanceolate-elliptic, narrowed at both ends, apex rounded or acute, 7–17 cm. long, 3–7 cm. wide, quite glabrous, even when young, and brown (when dry) above, glaucous with a few scattered hairs, especially on the pustular midrib, below, margins narrowly cartilaginous and slightly revolute, midrib channelled above, prominent and reddish below, primary nerves slender, hardly more prominent than the secondary, 8–13 pairs, arching and anastomosing well within the margin, ultimate reticulations fine, obscure. *Petioles* shallowly channelled above, 4–6 mm. long, rugose, glabrous. *Peduncles* leaf-opposed, 1-flowered, straight or slightly curved, 1·3–1·6 cm. long, thickened upwards, pustulate and thinly rufous-hairy, with 2–3 densely rufous-hairy, small bracts at the base and one a little higher; somewhat lengthening and considerably thickened in fruit, the persistent calyx lobes forming a sort of beaked collar. *Flowers* solitary, about 1 cm. long and wide,

yellow. *Sepals* 3, 3 mm. long, united below for about half their length, lobes very coriaceous, broadly ovate, apiculate, pustulate on both surfaces, shortly rufous-hairy without, glabrous within, rufous-ciliate. *Petals* 6, free, thickly coriaceous, thickest at the apex, the 3 outer orbicular, slightly concave, apiculate, 8–9 mm. diam., slightly keeled at the apex within, rufous-tomentose without, fuscous-tomentose on the thickened sides and near the apex within, glabrous and rugose on the lower half inside; the 3 inner like the outer but shorter, thicker (up to nearly 2 mm. thick at the apex) and more concave, fuscous-tomentose without, elsewhere glabrous. *Torus* stout, columnar, 2–3 mm. long, with a rim of rufous hairs at the base, glabrous above, apex truncate, shortly rufous-hairy. *Stamens* very numerous, 2–2·5 mm. long, the shape of a tin-tack, glabrous, the connective enlarged, hexagonal, flat, concealing the linear anthers. *Carpels* 40–50, linear, 2·5–3 mm. long; ovaries compressed, densely fuscous-villous, about twice the length of the slightly angular, glabrous, pustulate styles; stigmas conical, acute or bilobed. *Fruit* (young only seen) of about 15 carpels, ellipsoid, stalked, apex rounded or apiculate, densely felted with rufous hairs; stalk shorter than the carpel, grey or rufous, 1-celled, 1-seeded.

South Tenasserim. Thebyu chaung, 200 ft., February, *C. E. Parkinson* 1677; Mayinnge, Tenasserim River, 100 ft., March, *C. E. Parkinson* 1991 (type).

Named in honour of Mr. H. R. Blanford of the Imperial Forest Service, Burma.

Miliusa saccata *Fischer* [Anonaceae]; *M. longipedi* King et *M. cuneatae* Craib affinis, primo foliis caudatis, floribus binis, petalis interioribus saccatis glanduliferis, stigmatibus oblongis differt; secundo foliis caudatis, petalis glanduliferis longioribus, toris hirsutis differt.

A small tree. Branchlets brown, appressed fuscous-pubescent when young, later glabrescent, irregularly furrowed and with scattered, reddish-brown, corky lenticels. *Leaves* oblong, abruptly and acutely acuminate or caudate, rounded or subcuneate at the base, 8–18 cm. long, 4·5–8 cm. wide, caudicle 1–1·5 cm. long, glabrous above, except the minutely puberulous midrib, even when young, shining and sparsely hairy below, densely pellucid-dotted, midrib channelled above, prominent below, primary nerves 10–13 pairs, slender, subprominent below, regular, arching and forming a single loop near the margin, secondaries subregular, transverse, ultimate reticulations fine. *Petioles* channelled above, about 5 mm. long, covered with pustules in transverse rows, tawny-hirsute or nearly glabrous. *Flowers* 2 together in the axils, with several minute, orbicular, tawny-hairy bracts at the base of the pedicels. *Buds* globose, grey-pubescent. *Pedicels* minutely scattered-hairy and pustular in the lower half, 8–10 mm. long, with a small hirsute bracteole below the middle. *Sepals* 3, free, deltoid-ovate,

acute or subacute, 1–2 mm. long, ciliate, grey-hairy without, glabrous or nearly so within, sparingly gland-dotted. *Petals* 6, the 3 outer valvate in bud, spreading in flower, exactly like the sepals but generally very slightly longer; the 3 inner valvate, rather fleshy, saccate at the base, oblong, apex suddenly acute, about 1·6 cm. long, 0·8 cm. wide, obscurely veined, abundantly gland-dotted, glabrous on both sides. *Torus* elongate-ellipsoid, densely grey- or tawny-hairy in the upper half. *Stamens* about 20, 1–1.5 mm. long, filaments thick, more or less angular, bent outwards from beneath the outer rows of carpels, the anthers upright, connective peltiform, obtusely-apiculate, bearing the pollen sacs on the outer face. *Carpels* numerous, narrow, conical, the outer curved, about 1·5 mm. long, tawny-hirsute; styles oblong, about 1 mm. long, rounded at both ends, as wide as the apex of the carpel, smooth, glabrous, often shallowly channelled down one side; ovule 1, basal. *Fruit* not seen.

South Tenasserim. Kallin kwan chaung, 200 ft., Feb., *C. E. Parkinson* 1689.

This species links *Miliusa* with *Saccopetalum* owing to the saccate petals but falls into the first named because of the single-ovuled carpel. "Flowers yellow and deep red" (Parkinson).

Miliusa glandulifera *Fischer* [Anonaceae]; *M. fuscae* Pierre affinis, foliis majoribus, floribus binis glanduliferis, ovulis basalibus differt.

A large shrub. Branchlets glabrous, pale-brown, wrinkled, sparsely scattered with small, corky lenticels, with a bunch of brown hairs at the leaf insertions; young twigs minutely pustular. *Leaves* chartaceous, subsessile, elliptic, apex rounded or shortly, bluntly acuminate, base narrowed, slightly inequilateral, 7·5–15 cm. long, 3–6·5 cm. wide, glabrous above, with a few scattered hairs and the midrib glandular-pustulate below when young, soon quite glabrous, pellucid-dotted, midrib prominent below, primary nerves slender, indistinct, about 12 pairs, anastomosing near the margin with several loops. *Inflorescence* axillary, in few-flowered, erect racemes or cymes; peduncles very short with a boat-shaped, ciliate, sparingly hirsute bract at the base of each pedicel. *Flowers* about 1·3 cm. diam.; pedicels slender, 3–4 cm. long, glabrous, glandular, with a minute, ovate, obtuse, ciliate, glandular bracteole below the middle. *Sepals* 3, united at the base, lobes deltoid-ovate, acute, about 2 mm. long, ciliate, glabrous, densely glandular-pustulate. *Petals* 6, the 3 outer like the sepals but about half as long again and somewhat convex; the 3 inner valvate in bud, spreading in flower, suborbicular, slightly broader than long, bluntly apiculate, 6–7 mm. long, rather fleshy with a thickened, semicircular area at the base, tawny-ciliate, glabrous, densely glandular-pustulate, yellowish. *Torus* elongate. *Stamens* about 20 with a few additional imperfect ones outwards, mixed with whitish or tawny hairs nearly as long as the stamens, about 1 mm.

long, filaments short, stout, connective expanded, rounded at the apex, not concealing the anthers. *Carpels* about 20, mixed with whitish or tawny hairs, obcuneate, somewhat flattened, about 1 mm. long, glabrous, glandular-pustulate; style subglobose, about half the length of the carpel, glandular-pustulate; ovule 1, basal. *Fruit* not seen.

South Tenasserim. Mai nam wat, Theinkun chaung, 300 ft., Feb., *C. E. Parkinson* 1902.

The glands are more numerous and pronounced than in the previous species.

Saccopetalum unguiculatum *Fischer* [Anonaceae]; *S. longifloro* Hook. f. affinis, foliis minoribus, petiolis teretibus, floribus majoribus, petalis unguiculatis, stigmatibus sessilibus globosis differt.

Tree 60–80 feet high; branchlets grey, shallowly furrowed and transversely cracked; youngest twigs densely tawny-pubescent. *Leaves* chartaceous, oblong or obovate-oblong, apex narrowed, shortly, acutely acuminate, base rounded, rarely subcuneate, slightly inequilateral, margin entire, 6–12 cm. long, 3–5·5 cm. wide, copper-coloured when young and thinly tawny-pubescent on both surfaces, more densely so on the nerves, densely ciliate, shining and glabrous above when mature, except on the puberulous midrib, tawny-pubescent below, primary nerves 8–10 pairs, slender, subprominent below, arching and anastomosing near the margin, ultimate reticulations coarse, minutely pellucid-dotted. *Petioles* terete, 2–3 mm. long, tawny- or dark-brown pubescent. *Inflorescence* fascicled or of few-flowered racemes, sessile or shortly peduncled in the axils of existing or of fallen leaves, often 2-flowered, with several small, boat-shaped, tawny-tomentose bracts; rhachis tawny-tomentose, up to 6 mm. long. *Flowers* about 2 cm. long; pedicels slender, 5–13 mm. long, tawny-pubescent, sometimes with a minute bracteole about the middle. *Sepals* free, ovate, apex rounded, 4–5 mm. long, tawny tomentose on both surfaces, obscurely veined. *Petals* 6, the 3 outer similar to the sepals but lanceolate or subspathulate and slightly larger; the 3 inner valvate, deeply saccate at the base, about 1·8 cm. long, boat-shaped with a broad claw about 4 mm. long, apex subacute, tawny-pubescent on both surfaces, strongly veined, yellow with the veins purple. *Stamens* many, sessile, quadrate, connective not produced nor concealing the anthers. *Torus* subglobose, shaggy with tawny hairs. *Carpels* many, more or less 3-gonous, the outer curved and dorsally convex, about 2 mm. long, narrowed upwards to a rounded apex, more or less grey- or tawny-hairy, minutely rugulose, dark-brown or almost black; stigmas sessile, subglobose, similar in texture and indumentum to the carpels but much narrower; ovules 10. *Fruit* not seen.

South Tenasserim. Naungbwa, Theinkun chaung, 200 ft., Feb., *C. E. Parkinson* 1694.

Orophea katschallica *Kurz* [Anonaceae].

South Tenasserim. Mai nam wat, Theinkun chaung, 300 ft., Feb., *C. E. Parkinson* 1700.

Hitherto reported only from the Nicobar Islands.

Asteriastigma macrocarpa *Bedd.* [Flacourtiaceae].

This species had never been seen outside the evergreen forest of the Travancore State in Southern India.

Mytkyina District: Nawraw chaung, Dec., *C. E. Parkinson* 402. There is also a specimen in Herb. Kew. from the Hukong Valley, June, *R. S. Hole* 45.

Calophyllum Parkeri *Fischer* [Guttiferae]; *C. polyantho* Wall. affinis, nerviis foliis obliquis robustioribus, floribus pauci-oribus majoribus, petalis pluribus differt.

A small tree with terete, glabrous twigs; bark cracked into irregular flakes. *Leaves* narrowly to broadly elliptic, narrowed at both ends, apex obtuse, glabrous, 5–8·5 cm. long, 1·6–4 cm. wide, midrib and nerves prominent on both surfaces, midrib channelled above, nerves many, coarse, at an angle of about 40°, no intra-marginal nerve, margin thickened, entire, sometimes slightly undulate. *Petioles* stout, channelled above, glabrous, 0·7–1 cm. long. *Inflorescence* of simple, few-flowered racemes, solitary in the ultimate axils or terminal and several together, shorter than the leaves; rhachis and pedicels stout, more or less quadrangular, glabrous; bracts (not seen) early caducous and leaving large scars; pedicels about 1·3 cm. long. *Buds* globose. *Flowers* 1·5–2 cm. diam. *Sepals* 4, glabrous, shortly ciliate, the 2 outer orbicular, slightly cordate at base, 4–5 mm. diam., the 2 inner suborbicular, 6–7 mm. long. *Petals* 7, suborbicular to obovate, glabrous, shortly ciliate, 8–9 mm. long. *Stamens* very many, united at the base more or less into 4 bundles, glabrous, the inner up to 8 mm. long, the outer a little shorter, the free portion of the filaments filiform; anthers oblong, papillose, about 2 mm. long. *Gynaecium* about 1 cm. long, but owing to the curvature of the style only just over-topping the stamens; ovary subglobose, narrowed to the apex, 4 mm. long; style stout, terete; stigma peltate. *Fruit* not seen.

Tavoy, Nwalabo, 3100 ft., Dec., *R. N. Parker* 2313.

Dipterocarpus obtusifolius *Miq.* var. **cuspidatus** *Fischer* [Dipterocarpaceae]; a typo foliis cuspidatis, indumento fere toto stellato, alis fructus longioribus differt.

A tree up to 100 feet in height and 8 feet in girth. Leaves wider in proportion than those of the type and abruptly cuspidate, the lower half of the leaf is cuneate but rounded at the base; the *petioles* are shaggy with rufous, stellate hairs, simple hairs are apparently altogether wanting or are early deciduous; the two wings of the *fruit* are much longer, attaining 17 cm. in length and 3 cm. in width and are sparingly dotted with small stellate hairs. (Fig. 1.)

South Tenasserim. Ngawun Reserve, 200 ft., Jan., *C. E. Parkinson* 1620 (type). There are also in the Kew Herbarium two sheets of this same variety: Hantawaddy District, Thanat chaung, Feb., *J. H. Lace* 2914; Amherst District, Natchaung Reserve, 100 ft., Feb., *J. H. Lace* 5580.

Miquel saw neither stipules nor flowers. In the present variety the stipules are ensiform, 6–15 cm. long, 1·2–1·75 cm. wide, covered outside with small tubercles from each of which arises a tuft of long, rufous hairs surrounded by short, greyish hairs, with minute, stellate hairs between the tubercles, glabrous within, with straight, parallel nerves, rather prominent on the inner surface, 10–12 at the base, reduced to about 4 upwards by conjunction and by splitting up into veinlets, the remainder anastomosing near the obtuse apex.

Parkinson's specimens lack flowers but Lace's have both flowers and fruit and the former agree with the description given by Pierre in Fl. For. Cochin. The calyx, however, is less tomentose and with shorter indumentum than is the case with specimens from Burma and Siam which seem to be the typical form.

It is curious that of the authors consulted only Miquel mentions stellate hairs though they are present in most specimens of the typical form and are probably concealed below the longer simple hairs in the others.

There is a very strong resemblance between *D. obtusifolius* Miq. and *D. Duperrianus* Pierre, and I am very doubtful that they can be maintained as separate species.

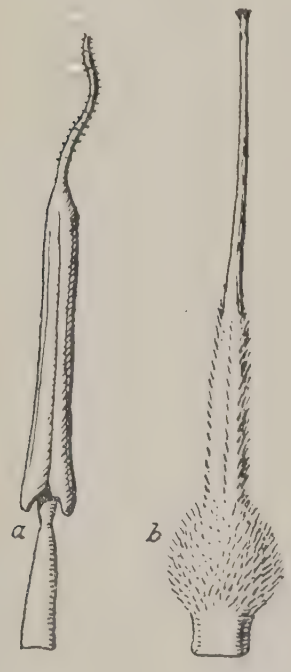

Fig. 1—*Dipterocarpus obtusifolius* Miq. var. *cuspidatus* Fischer

a. stamen x 8. *b*. pistil x 8.

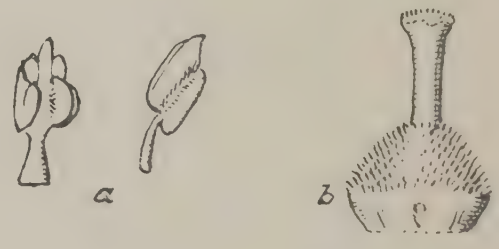

Fig. 2—*Vatica astrotricha* Hance

a. stamen, front and side aspects x 10. *b*. pistil x 8.

Dipterocarpus angustialatus *Heim* in Bot. Tids. xxv (1903), 43. [Dipterocarpaceae].

This species was discovered during the Danish expedition to the Gulf of Siam on the island of Koh Chang. Heim had only fruiting specimens and the following amplification is based on flowering shoots.

A large tree attaining 150 feet in height. *Leaves* underneath with long, simple, appressed hairs mixed with short, stellate hairs on the midrib and primary nerves, the veins with short, stellate hairs. *Inflorescence* of supra-axillary, 5-flowered racemes, 8–10 cm. long; peduncle 2–3 cm. long, sulcate, more or less densely fulvous stellate-tomentose; rhachis jointed on the peduncle, terete, sulcate in the apical portion of each internode by the decurrent pedicels; pedicels 2–3 mm. long, grey stellate-pubescent. *Flowers* 4–5 cm. long and wide. *Calyx* turbinate, subfleshy, tube about 1 cm. long, 0·6 cm. wide at the mouth, obscurely 5-ribbed at the mouth, dotted with minute, grey or fuscous, stellate hairs without, within appressed white-hairy near the mouth, glabrous elsewhere, 2 of the lobes ligulate, 1·3–1·5 cm. long, apex rounded, densely grey-tomentose with simple (all ?) hairs on both sides, the other 3 lobes semicircular, about 3 mm. long, grey stellate-pubescent. *Petals* free, linear-spathulate, apex rounded, about 4·5 cm. long, 1 cm. wide, covered with minute, scaly, whitish, stellate hairs on the portions exposed in bud on the outside and to a lesser extent inside, the other parts glabrous, pale yellow to scarlet. *Stamens* about 30, 1–1·2 cm. long, glabrous; filaments 1–2 mm. long, flattened, broadening slightly upwards; anthers linear, 5 mm. long, shortly sagittate at the base, with rounded lobes, tapering to the finely aristate connective which is about as long as the anther. *Ovary* ellipsoid, 5-grooved, 4–5 mm. long, densely appressed grey-hairy, tapering into a narrow, subulate, hairy stylopodium, 3-celled, 6-ovuled; style filiform, glabrous, overtopping the stamens; stigma cup-shaped, minutely pubescent.

South Tenasserim. Thebyu chaung, 200 ft., Feb., *C. E. Parkinson* 1679.

Dipterocarpus Dyeri *Pierre* [Dipterocarpaceae].

Hitherto found only in Cochinchina.

South Tenasserim. Ngawun Reserve, 200 ft., Jan., *C. E. Parkinson* 1621.

Vatica astrotricha *Hancé* in Jour. Bot. 1876, 241 [Dipterocarpaceae].

Previously known from Cambodia and Cochinchina. Hance's description was based on fruiting specimens only, the following, which differs a little from that of Guérin in the Fl. Gen. Indo-Chine, is of the flowers.

Flowers about 1·6 cm. long and wide. *Sepals* united at the base into a short tube above the torus, densely stellate-hairy without, densely simply-tomentose within, the 2 outer lobes oblong,

rounded, 4 mm. long, the 3 inner lanceolate, acute, slightly shorter than the outer. *Petals* oblanceolate-oblong, sometimes slightly falcate, apex rounded, 1·3 cm. long, 4 mm. wide, one margin straight, the other curved (in falcate petals one margin less curved than the other), slightly concave at the base, fuscous stellate-tomentose without on the part exposed in bud (the straighter side) and ciliate on that side and at the apex, elsewhere glabrous, white. *Stamens* 13, 1·5 mm. long; filaments flat, triangular, tapering to the oblong anther; anterior lobes of anther larger than the posterior, rounded at the base, connective produced into a short, bluntish mucro. *Pistil* 2·5 mm. long; ovary depressed-conical, broader than long, grooved, glabrous below, densely fulvous-hairy above; style terete, stout, slightly angled, slightly longer than the ovary; stigma peltate, minutely multi-lobed. (Fig. 2.)

South Tenasserim. Kyein chaung, 200 ft., Nov., *C. E. Parkinson* 1667.

Shorea Buchananii *Fischer* [Dipterocarpaceae]; *S. bracteolatae* Dyer affinis, bracteis minoribus stellato-tomentosis, floribus minoribus, antheris cuspidatis sine aristis, ovariis dense hirsutis differt.

A large tree. Twigs terete, brown, with scattered, small, round, corky warts, minutely stellate-pubescent upwards. *Leaves* oblong, elliptic or ovate-elliptic, base rounded, entire, midrib shallowly channelled above, strong and prominent below, nerves 12–17 pairs, prominent, regular, slightly curved and inarching just within the margin, secondary nerves numerous, close, regular, transverse between the primaries, visible above when dry, subprominent below, with minute reticulations between, margin entire, very narrowly cartilaginous, green and glabrous above, pale or olive-brown below, with scattered, minute, stellate hairs and dotted with minute, reddish-brown glands, 15–22·5 cm. long, 6–10 cm. wide. *Petioles* 1·2 cm. long, glabrous, rugose, brown. *Inflorescence* in axillary cymes, 8–14 cm. long; rhachis brown, terete below, more or less bluntly quadrangular upwards, more or less densely covered with grey, stellate tomentum. *Flowers* very shortly pedicellate, about 1 cm. long; bracts 2, persistent, oblong, obtuse, grey stellate-tomentose without, pubescent within, ciliate, 7 mm. long, 3–4 mm. wide. *Sepals* 5, imbricate, narrow lanceolate to broad ligulate, tomentose without, finely pubescent within, ciliate, blunt, 6 mm. long, 2–3 mm. wide, the 2 inner slightly shorter and narrower. *Petals* 5, generally twisted to the left in bud, slightly longer than the sepals, broadly strap-shaped or obovate, rounded, somewhat fleshy, tomentose on both sides. *Stamens* 15–20, quite glabrous, about 3 mm. long; filaments expanded at base, filiform above, anther linear-oblong, as long as or slightly longer than the filament, connective produced into a stout, acute, slightly curved cusp $\frac{1}{4}$–$\frac{1}{2}$ the length of the anther. *Ovary* much shorter than the stamens, subglobose, densely hairy; style slender, slightly overtopping the stamens, hairy below, glabrous above; stigma terminal,

undivided; stylopodium very short, glabrous. *Fruit* not seen. (Fig. 3.)

Mytkyina District: Tagwin, in evergreen forest, Nov., *C. E. Parkinson* 318 (type); *E. M. Buchanan* per *J. H. Lace* 20.

Fig. 3.—*Shorea Buchananii* Fischer stamen x 7.

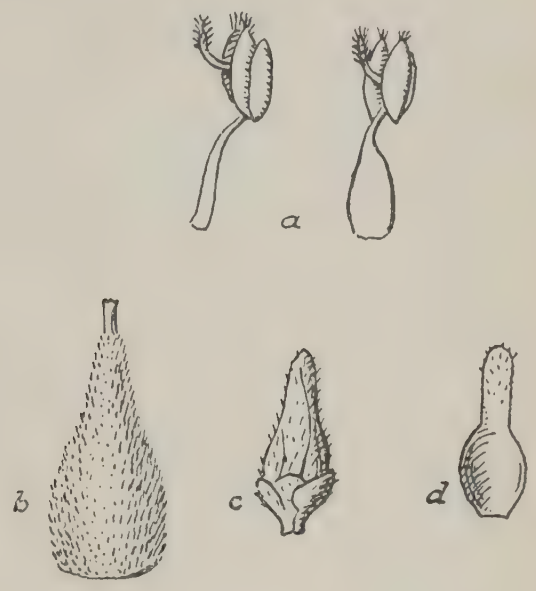

Fig. 4.—*Shorea argentea* Fischer
a. stamen x 7. *b*. pistil x 7.
c. bud very slightly enlarged.
d. petal natural size.

Shorea argentea *Fischer* [Dipterocarpaceae]; *S. obtusae* Wall. affinis, ramulis juventibus lepidotis, foliis majoribus, nervis paucioribus ad axillis eglandulosis, floribus majoribus, thecis antheris acutis differt.

Tree 80 feet high, branchlets brown, smooth; young twigs covered with minute, greyish, fringed, peltate scales. *Leaves* oblong or obovate-oblong, bluntly acuminate, narrowed into the petiole, 10–15 cm. long, 4·5–6·5 cm. wide, glabrous above, shining and nearly glabrous below, there being a very few simple and stellate hairs, midrib and primary nerves impressed above, rather prominent below, primary nerves 9 or 10 pairs, slightly curved, not anastomosing, secondary nerves numerous, obliquely transverse between the primaries, ultimate reticulations minute, axils of the nerves without glands. *Petioles* channelled above, laterally compressed, 2–2·5 cm. long, dotted with fringed, peltate scales and minute, simple and stellate hairs; stipules early deciduous, ovate, obtuse, 6–7 mm. long, densely covered with fringed, peltate scales without, less densely within, ciliate with simple hairs. *Inflorescence* of extra-axillary and terminal, sometimes leafy, panicled, unilateral cymes, rhachis sulcate and angled, covered with fringed, peltate scales, increasingly mixed upwards with simple hairs and increasingly whitish. *Buds* elongate ovate-lanceolate, obtuse, 1–1·3 cm. long, silvery silky. *Flowers* sessile or very shortly pedicelled; bracteoles very early deciduous (not seen). *Sepals* imbricate, broadly

ovate-cordate, subacute, the 3 outer 3 mm. long and as wide at th base, the 2 inner slightly smaller, all densely silvery silky-tomento without, glabrous within, ciliate. *Petals* free, twisted or over lapping in bud either way, spoon-shaped, the basal portion sub orbicular, concave, 5–6 mm. diam., the apical portion ligulate obtuse, 8–9 mm. long, 2–2·5 mm. wide, parallel veined, vein about 13 at base and about 10 in the ligulate part, silvery with appressed silky hairs without, except at the very base, glabrou for the lower two-thirds, thinly and shortly silvery silky-hairy above within, yellow with a purplish smear at the base. *Stamen* 30–35, 2–3 mm. long; filaments flat below, tapering to a filiform apex, glabrous; anthers oblong, 0·5–1 mm. long, bases acute and slightly divergent, posterior loculi with a fringe of whitish hair near the apex, connective produced into a setose, curved mucr nearly as long as the anther, emerging at a right angle from betwee the two posterior loculi at about their middle and then bent upright *Pistil* about 4 mm. long; ovary ovate, slightly grooved at the base narrowed gradually into the subulate stylopodium, densely grey hairy, as is the stylopodium; style short, glabrous, trigonous a the apex with 3 minute stigmatic teeth. *Fruit* not seen. (Fig. 4.

South Tenasserim. Near Negya Daung Pass, 600 ft., Feb. *C. E. Parkinson* 1684.

Shorea cinerea *Fischer* [Dipterocarpaceae]; sectioni *Brachy pterae* (sensu Brandis) affinis, ab omnibus hujus sectionis specibu gemmis majoribus ellipsoideis, antheris linearibus, connectivi brevibus mucronatis differt.

"A very large tree with dark-brown furrowed bark" (fid Parkinson). Branchlets pale-brown, glabrous; twigs dark-brown glabrous, striate, with small, scattered lenticels. *Leaves* linear oblong to ovate-oblong, bluntly acuminate, base rounded, rarel narrowed, 15–25 cm. long, 4·5–7·5 cm. wide, glabrous, minutel scurfy-scaly below, midrib prominent, raised below, primar nerves about 15 pairs, slender, distinct on both surfaces, hardl raised below, ascending, nearly straight and then following th margin, not anastomosing, axils eglandular, secondary nerve numerous, transverse between the primaries, ultimate reticulation fine and distinct on both surfaces. *Petioles* channelled above 1·5–2·5 cm. long, glabrous. *Inflorescence* of axillary, sometime terminal and leafy, panicles, solitary, shorter than the leaves rhachis more or less quadrangular in section, minutely hoar stellate-pubescent. *Buds* ellipsoid, blunt, about 5 mm. long 4 mm. wide. *Flowers* sessile or very shortly pedicelled, abou 7 mm. across, with 2 minute, cinereous-tomentose bracteoles *Sepals* very shortly connate at base, segments ovate-lanceolate acute, subequal, 1·5–2 mm. long, shortly cinereous-tomentos without, glabrous within. *Petals* overlapping generally to th right in bud but sometimes to the left, very shortly united at th base, lobes oblong, apex rounded or truncate, about 6 mm. long 4 mm. wide, 8-veined, shortly cinereous-tomentose without on th

part exposed in bud and less densely so on the part concealed, glabrous or nearly so at the base within, increasingly cinereous pubescent towards the apex, white. *Stamens* 15, about 4·5 mm. long; filaments filiform above, subrotund or oblong below, glabrous, anthers linear, connective produced into a short mucro, base shortly sagittate with a few short bristles from each point, about 3·5 mm. long, sparsely, minutely hairy, the dorsal surface minutely punctate. *Ovary* depressed-globose, about 1 mm. long, densely grey-brown-velvety; stylopodium 0; style terete, slightly longer than the ovary, cinereous-pubescent at the very base, otherwise glabrous, slightly enlarged just below the stigma; stigma cup-shaped, margin minutely 5-toothed. *Fruit* not seen. (Fig. 5.)

South Tenasserim. Thebyu chaung, 600 ft., Feb., *C. E. Parkinson* 1681.

Fig. 5—*Shorea cinerea* Fischer stamen x 7.

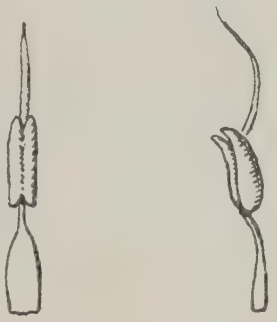

Fig. 6—*Shorea farinosa* Fischer stamen front and side aspects x 6.

Shorea farinosa *Fischer* [Dipterocarpaceae]; *S. hypochrae* Hance affinis, ramulis glabris, foliis longioribus angustioribus acutioribus, in nervorum axillis domatis presentibus, floribus subsessilibus, petalis albo-sericeis differt.

A tree reaching 150 feet high. Branchlets grey, terete, glabrous, abundantly, minutely lenticellate; twigs slightly angular or compressed, dark-brown, glabrous. *Leaves* oblong or oblong-lanceolate, rounded or acute, narrowed to a rounded base or truncate, 8–16 cm. long, 4–5·5 cm. wide, glabrous except the midrib which is minutely pubescent, minutely mealy on the nerves and veins below, midrib impressed above, very prominent below, primary nerves 15–18 pairs, prominent below, regular, slightly curved, inarched and anastomosing near the margin, with small hairy domatia in the axils, secondary nerves transverse between the primaries, very slender, ultimate reticulations minute. *Petioles* terete, narrowly channelled above, 2–3·5 cm. long, dark-brown, glabrous, slightly rugose. *Inflorescence* of axillary and terminal one-sided racemes and cymes forming large, terminal panicles by the fall of the leaves, angular and somewhat compressed, very minutely pubescent. *Flowers* rather distant, sessile or nearly so in bud; pedicel lengthening later but always very short, ridged, velvety stellate-tomentose. *Sepals* free, ovate-cordate, 5·5–6·5 mm. long, diminishing in size

inwards, 2 outer unequal at base, rounded at the apex, 3 inner increasingly acute, all densely velvety with stellate hairs without and ciliate, within glabrous at the base, pubescent towards the apex. *Petals* broadly ovate-oblong, inequilateral, apex obtuse, 1·2–1·3 cm. long, about 0·7 cm. wide, 15-veined at the widest part, clothed with long, whitish, silky hairs on the part exposed in bud and ciliate on the same margin, glabrous elsewhere. *Stamens* 22–25, 6–7 mm. long, filaments flat, ovate below, shortly filiform above; anthers linear-oblong, 1·5 mm. long, rounded at the base, loculi separate and acute at the apex, connective prolonged into a seta 2·5–3 mm. long. *Pistil* 5·5–6 mm. long; ovary ellipsoid, narrowed into the subulate stylopodium and style, ovary and stylopodium minutely hairy; style glabrous, about as long as the rest of the pistil; stigma 3-lobed. *Fruit* not seen. (Fig. 6.)

South Tenasserim. Ngawun Reserve, 300 ft., Jan., *C. E. Parkinson* 1610 (type); Theinkun chaung banks, 100 ft., Feb., *C. E. Parkinson* 1919.

Hopea oblongifolia *Dyer* var. **grandis** *Fischer* [Dipterocarpaceae]; a forma typica foliis et floris longioribus differt.

A tree attaining 80 feet in height; branchlets terete, glabrous, brown; young twigs somewhat compressed, glabrous, dark. *Leaves* oblong, acuminate, base rounded, inequilateral, 15–30 cm. long, 6–10 cm. wide, quite glabrous, midrib prominent below, primary nerves generally 10 pairs, distant, prominent below, erect, slightly curved, not anastomosing, axils glandless, secondary nerves numerous, slender, transverse between the primaries, ultimate reticulations minute, margin very narrowly cartilaginous. *Petioles* narrowly channelled above, 1·5–2 cm. long, glabrous. *Inflorescence* of axillary, one-sided, racemose cymes or panicles, shorter than the leaves, solitary or 2 together, with several minute, triangular, tomentose scales at the base; rhachis and its branches glabrous, slightly angular when dry, with minute, triangular, hairy bracts at the divisions; branches of the rhachis 5–8-flowered, with a minute, scaly, ciliate, puberulous bracteole at the base of each pedicel; pedicels stout, about 2 mm. long, puberulous. *Buds* ovate, subacute. *Flowers* about 1·3 cm. long and wide. *Sepals* free, ovate, obtuse, 5 mm. long, the 2 outer about 4 mm. wide at the base, the other 3 progressively narrower, the 2 outer greyish-tomentose without and on the apical third within, the lower part glabrous, the 3 inner more thinly tomentose without with a narrow, glabrous, whitish margin, quite glabrous within, all 5 more or less ciliate, the inner tending to be eciliate towards the base. *Petals* free, overlapping to the left or right, oblong, slightly falcate and inequilateral, apex rounded, the margins near to it more or less erose, about 1·2 cm. long, 0·4 cm. wide, grey silky-pubescent without on the portion exposed in bud and ciliate on that margin, glabrous elsewhere. *Stamens* 15, nearly 3 mm. long including the setaceous connective, quite glabrous, filament expanded, wedge-shaped, very shortly filiform at the apex; anther suborbicular,

about half the length of the filament; connective produced into a slender seta about as long as the filament. *Pistil* 5 mm. long; ovary ellipsoid, glabrous below, thinly hairy in the upper half, slightly narrowed into the stylopodium, 3-celled, 6-ovuled; stylopodium stout, columnar, slightly widened near the apex and then suddenly narrowed into the style, thinly hairy below, glabrous above, about twice as long as the ovary; style short, glabrous; stigma slightly swollen, cup-shaped. *Fruit* not seen. (Fig. 7.)

South Tenasserim. Thebyu chaung, 600 ft., Feb., *C. E. Parkinson* 1685.

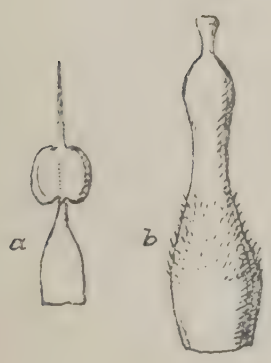

Fig. 7—*Hopea oblongifolia* Dyer var. *grandis* Fischer
a. stamen x 8. *b.* pistil x 7.

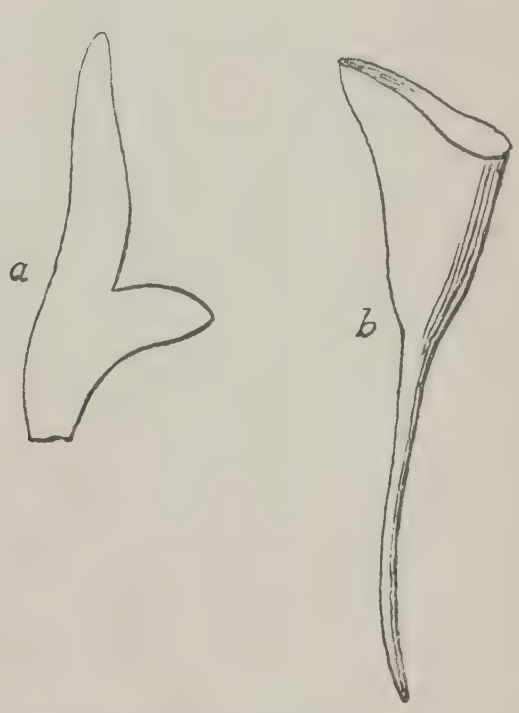

Fig. 8—*Impatiens sarissiformis* Fischer
a. wing x 2. *b.* lip x 2.

Hibiscus Parkinsonii *Fischer* [Malvaceae]; *H. macrophyllo* Roxb. affinis, foliis valde minoribus subtus pallido-tomentosis, 3–5-glandulosis petiolis valde minoribus brevibus pubescentibus, stipulis minoribus externe glabris differt.

A slender tree 40 feet high; twigs terete, ringed with the scars of the fallen stipules and marked with large, horseshoe-shaped, close-set leaf-scars, minutely hairy with dark, brittle hairs. *Leaves* orbicular, suddenly caudate, base deeply cordate with a narrow sinus, 6–9 cm. diam., caudicle slender, acute, 1·5–1·7 cm. long, glabrous and slightly mealy above when young, densely felted with cream-coloured, stellate tomentum below, ciliate, 7–9-ribbed, the 3 middle ribs, and sometimes the next pair, bearing below a long, naked gland, that of the midrib placed at about the middle, of the next 2 at about one-third of its length above the base, and of the next pair, if present, still nearer the base, primary nerves 3–4 pairs from the midrib in its upper half and 3 or 4 from the

outer side of the other ribs, secondary nerves transverse, ultimate reticulations fine, margins shallowly crenate-undulate. *Petioles* terete, slender, slightly enlarged at both ends, 3–5 cm. long, glabrous near the base and increasingly creamy stellate-pubescent upwards; stipules shortly and broadly petioled, linear-lanceolate, somewhat falcate, acute, 4–5 cm. long, glabrous without, covered with long, creamy, simple, silky hairs within. *Flowers* axillary, solitary; pedicels 3–5 cm. long (in fruit) bearing 2 deciduous bracts which leave an annular scar at or above the middle, articulated just above the scar, the pedicel below the scar slender, enlarging very slightly upwards, glabrous, above the articulation stout and markedly enlarged upwards (at least in fruit) and densely fulvous stellate-tomentose. *Bracteoles* 10, free, linear, obtuse, 1·3–1·5 cm. long (in fruit), fuscous stellate-hairy along the middle without and glabrous along the margins, covered with long, simple hairs along the median line within and with short, brownish hairs along the margins. *Calyx* shortly turbinate below with 5 lanceolate, obtuse lobes 3–4 times as long as the tube, about 2 cm. long (in fruit), fuscous stellate-tomentose without, covered with long, simple hairs within. *Petals*, *stamens* and *pistil* not seen. *Fruit* 5-valved, valves woody, shortly, finely aristate, densely shaggy with long, fuscous hairs without, glabrous and shining within, slightly shorter than the calyx; seeds several in each cell, ear-shaped in outline, about 4 mm. long, densely shaggy with long, rufous hairs along the margins, the faces glabrous, black, minutely papillose with reddish-brown papillae disposed in irregular, discontinuous, concentric lines.

South Tenasserim. Mai nam wat, Theinkun chaung, 400 ft., Feb., *C. E. Parkinson* 1909.

Hibiscus flavotrichus *Fischer* [Malvaceae]: *H. tiliaceo* Linn. affinis, foliis ovatis supra pubescentibus, bracteolis 6 fere liberis, antheris haud in parte inferiore presentibus differt.

A slender tree 40 feet high. Branchlets brown, striate, glabrescent; twigs densely fuscous stellate-tomentose. *Leaves* broadly ovate, acute, base truncate, emarginate or shallowly cordate, 5–13 cm. long, 4–8·5 cm. wide, when dry purplish above, dotted with minute, stellate hairs, densely so on the ribs and nerves, densely buff or creamy stellate-tomentose below with scattered, rather larger, fuscous, stellate hairs, pellucid-dotted, ribs 3, the middle one bearing below a narrow gland a little above the base, ribs and nerves slightly impressed above, prominent below, primary nerves 4–5 pairs from the midrib and about 6 pairs from the outer side of the lateral ribs, secondary nerves transverse, reticulations obscure, margins crenulate. *Petioles* terete, striate, 1·5–3·5 cm. long, fuscous stellate-tomentose. *Stipules* 2, linear-ensiform, acuminate, 6–8 mm. long, felted with fuscous, stellate tomentum. *Buds* ovate, acuminate. *Flowers* axillary, solitary, 5–6 cm. diam.; pedicel 3–4 cm. long, not jointed, striate, felted with yellowish-

green, stellate tomentum; bracteoles 6, very shortly united at the base and to the base of the calyx-tube, linear or ovate-lanceolate, acute, 7–8 mm. long, felted with short yellowish-green, stellate tomentum on both faces. *Calyx* united below into a campanulate tube, 5–6 mm. long, lobes ovate-lanceolate, acute, 1–1·2 cm. long, felted with yellowish-green, stellate tomentum without, brown and glabrous within the tube and on the lower half of the lobes, the margins and upper halves felted with short, grey, stellate tomentum, lobes thickened near the margins. *Petals* broadly obovate, about 3·5 cm. long, thin, veined, dotted outside with fine, white, crisped, stellate hairs and coarser yellow, stellate hairs, glabrous within except for a patch of brown, mealy hairs at the base, margin white-ciliate for about 1 cm. from the base; mauve. *Stamens* united into a slender column 3–4 cm. long, antheriferous along the upper half, shortly brown-pilose, apex toothed; free portion of filaments filiform, 2–4 mm. long, glabrous; anthers numerous, pollen grains globose, muricate. *Ovary* densely covered with long, yellowish hairs; styles dividing into 5 branches, shortly exserted from the staminal column, stigmas globose, small. *Fruit* 5-valved, valves woody, acuminate, not aristate, slightly shorter than the calyx, densely clothed without with turgid, curved, acicular, orange, stellate hairs. *Seeds* 1 (?) in each cell, reniform, smooth, 3–4 mm. long, densely clothed with long, warm-buff, silky hairs.

South Tenasserim. Chaungnaukpyan, 300 ft., Jan., *C. E. Parkinson* 1640.

Hibiscus fragrans *Roxb.* var. **glabra** *Fischer* [Malvaceae]; a forma typica ovariis glabris differt.

A climber (always?); branchlets and twigs terete, grey or fuscous stellate-tomentose, the younger parts almost floccose. *Leaves* ovate-cordate, acuminate, basal lobes rounded, sinus wide, 8–13 cm. long, 6–9 cm. wide, 7-ribbed, ribs prominent on both surfaces, primary nerves 3 pairs from the midrib above the middle and 2–3 from the outer side of the lateral, all inarching and anastomosing a little within the margin, secondary nerves distinct, rather irregular, hoary stellate-pubescent above, densely so on the ribs and nerves on both sides, thinly stellate-pubescent or glabrescent elsewhere below, margins crenate- or undulate-denticulate. *Petioles* 3–6 cm. long, densely grey or fuscous stellate-tomentose. *Stipules* (not seen) early deciduous leaving linear scars. *Flowers* 1–3 together in the axils of the (generally reduced) upper leaves and forming terminal, leafy panicles, 4·5–6 cm. diam.; pedicels slender, 3·5–4 cm. long, jointed a little below the flower, densely grey or yellowish-green stellate-tomentose. *Involucre* 1·2 cm. long, of 5 bracteoles united into a cup for about half their length, the free lobes ovate, acute, 5-veined, dark-brown (at least when dry), thickly dotted with soft, hoary or fuscous, stellate hairs without, less densely within, ciliate. *Calyx* 1·5 cm. long, united into a campanulate cup for about half its length, the 5 lobes ovate, sub-

acute, 5-veined, densely and softly hoary or fuscous, stellate-tomentose on both sides in the lower half, more sparingly so on the lobes, mixed outside and especially on the lobes with stout, simple, glandular (?), dark, often hooked, hairs from bulbous bases. *Petals* united at the base into a short tube enclosing the ovary, obovate, rounded, much contracted, almost clawed, just above the tube, 2·5–3 cm. long, 1·2–2 cm. wide, ciliate with stellate hairs for a distance of 2–3 mm. above the tube, with scattered, whitish or fuscous, small stellate and larger 3-armed hairs outside, mainly on the side exposed before expansion, glabrous within, about 15–veined; pink. *Staminal column* united with the corolla-tube, free portion about 1 cm. long, mouth truncate and ciliate with a few simple hairs, abundantly antheriferous in the upper half, stout, sulcate, with a few stellate hairs at the very base; anthers oblong, 2 of the cells shorter than the other 2; pollen grains globose, strongly muricate. *Ovary* conical, 4–5 mm. long, glabrous, minutely papillose, 5-celled; ovules reniform, glabrous; style slender, glabrous, divided above the staminal column into 5 stout, clavate, glabrous arms; stigmas capitate, glabrous. *Fruit* not seen.

Myitkyina District. Pinbaw, Nov., *C. E. Parkinson* 364.

I cannot separate this specimen from *H. fragrans* Roxb. by any other constant character than the glabrous ovary. The Wall. Cat. No. 1911A quoted under this name in the Fl. Br. India, has a glabrous ovary as well as all those dissected from specimens identified as of that species in the Herb. Kew., including that from a flower on a specimen collected by Jenkins in Assam which has as well a densely tomentose capsule! Guérin in the Fl. Gen. Indo-chine states that the ovary is tomentose (*ovaire velu*).

Some of the species identified as *H. fragrans* Roxb. in the Herb. Kew. are described on the labels as climbers; it seems probable that, as in many other species, the plant is a facultative climber on occasion.

Neesia synandra *Mast.* [Malvaceae].

Hitherto known only from the Malay Peninsula.

Burma. South Tenasserim, Tenasserim River, Kanoungyi, at about sea-level, Feb., *C. E. Parkinson* 1981.

Elaeocarpus floribundus *Bl.* [Elaeocarpaceae].

None of the authors describing this species has mentioned the round, dark glands on the under side of the leaves though these are present more often than not and in specimens from all localities. Some have also omitted mention of the peculiar pustules on both sides of the leaves which offer a nearly invariable and characteristic feature.

Sloanea Kerrii *Craib* [Elaeocarpaceae].

Known so far only from Siam.

Tavoy. Nwalabo, 3100 ft., July, *R. N. Parker* 2307.

Impatiens sarissiformis *Fischer* [Geraniaceae]; *I. Wattii* Hook. f. affinis, foliis, sepalis, petalisque omnibus angustioribus differt.

A slender herb 3–5 dm. high; stem decumbent below, rooting, roots fibrous; stem purplish above, striate when dry, nodes slightly tumid; quite glabrous except for the perianth. *Leaves* alternate, linear, acuminate, base tapering and decurrent to the base of the petiole, stipular glands absent, margin distantly crenate, crenatures minutely setigerous, sometimes very shallow, 4–10 cm. long, 0·3–0·7 cm. wide, a few leaves from axillary buds in the middle of the stem much shorter and lanceolate or spathulate. *Peduncles* erect, from the upper axils, very slender, 2–3-flowered, nodes slightly tumid, 2–4 cm. long when in flower; bracts minute, deciduous. *Flowers* deep yellow; pedicels capillary, about 1 cm. long in flower, lengthening in fruit. *Sepals* 3, lateral oblong-falcate, apiculate, 4·5 mm. long, 2 mm. wide, posterior infundibuliform, narrowed into a long, slender, straight spur, the funnel-shaped portion about 1 cm. long and 0·9 cm. wide at the mouth, the spur 2 cm. long. *Petals* 3, anterior suborbicular, slightly convex, apex rounded, retuse or shallowly 2-lobed, 8 mm. long, wings linear-lanceolate, subacute, 2 cm. long, with a broad, falcate, subacute lobe 0·7 cm. long; the lip and petals with minute, scattered hairs, at least in bud. *Ovary* narrow-ovate, 3–4 mm. long; ovules numerous, ellipsoid, glabrous. *Fruit* (immature) narrowly clavate. (Fig. 8.)

Myitkyina District. Pidaung chaung, Dec., *C. E. Parkinson* 373, "Growing near water."

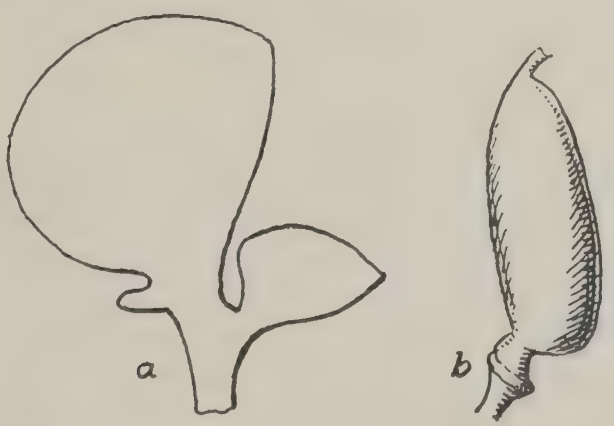

Fig. 9—*Impatiens Parkinsonii* Fischer
a. wing x 3½. b. fruit x 3.

Impatiens Parkinsonii *Fischer* [Geraniaceae]: *I. acuminatae* Benth. affinis, pedunculis longioribus, bracteis angustioribus, floribus minoribus differt.

A glabrous, aquatic herb 2–3 dm. high; roots fibrous; stem rooting near the base, glabrous, sulcate when dry, more or less papillose upwards. *Leaves* alternate, lanceolate to oblanceolate, acute, apiculate, base finely tapered and decurrent to the subamplexi-

caul base of the petiole, stipular glands absent, midrib broad, nerves 6–8 pairs, ultimate reticulations minute, rounded, margins more or less crenate, crenatures minutely apiculate, 5–8 cm. long, including the petiole, 1–2 cm. wide. *Peduncles* solitary in the upper axils, erect, longer than the leaves, purplish upwards, 6–13-flowered. *Flowers* racemose, erect, deep-purple; bract at the base of the pedicel persistent, ovate, lanceolate, acuminate, veined, 6–7 mm. long, purplish; pedicels capillary, about 1·5 cm. long, purple. *Sepals* 3, the 2 lateral ovate-rotund, inequilateral, apiculate, base rounded, 5-veined, 6–7 mm. long, the posterior ovate, concave, a little larger than the lateral, acute, narrowed into a stout, incurved spur about 2 cm. long. *Petals* 3, anterior obovate-rotund, 8 mm. long, wings long-clawed, limb obovate, 1 cm. long with a short posterior ligulate auricle and a large, anterior, falcate, acute one 5 mm. long. *Ovary* ellipsoid. *Fruit* ellipsoid, inequilateral, slightly furrowed when dry, about 1 cm. long; seeds numerous, egg-shaped, 1–1·5 mm. long, furnished with long, delicate, spirally wound, white hairs. (Fig. 9.)

Myitkyina District. Namti chaung feeder, Dec., *C. E. Parkinson* 407 (type); Pidaung Range, Dec., 500–800 feet, *E. M. Buchanan*, "Growing in water."

Turraea pumila *Benn.* [Meliaceae].

Previously reported from Java.

Maymyo Plateau, 2500 ft., June, *C. E. Parkinson* 1148. Northern Shan States, Jan., *J. H. Lace* 5216.

LVII.—ON THE HISTORY OF NEPENTHES LAEVIS.

J. M. Macfarlane.

This species has had a somewhat chequered history. United with *N. gracilis* by Korthals, and in part also by Miguel (Fl. Ned. Ind. 1855) it was first rather imperfectly described as *N. laevis* by Lindley from plants raised by and sent out by Veitch to Botanic Gardens. The present writer minutely studied it at the Royal Botanic Garden, Edinburgh, in 1881, and at Veitch's Nursery in 1884, But its many points of resemblance to *N. gracilis* caused him, in want of sufficient native material, to unite it with the latter species in the "Pflanzenreich." More abundant material fully proves its distinctness. The nonciliate wings, the deeply decurrent leaf bases, the orbicular lid with few perithecioid honey glands, the discrete exposed digestive glands, and the very short staminal column with few anthers are diagnostic. A revised description is given below.

N. laevis *Lindl.* in Gard. Chron. (1848) ii, 655; Veitch, Hort. Veitchii (1906) 302; Macfarl. Pflanzenreich iv, 3 (1908) 58.

Plant slender, diffuse branching, branches climbing or at times creeping and rooting, then with nodal clusters of small pitchered

leaves on short branch-spurs. *Stem* triangular or subrotund in section, 8 dm. or more long by 3–4 mm. thick, when young ferrugineo-villose, soon glabrous. *Leaves* 7–15 cm. long, 1·5–3 cm. wide, lanceolate, sessile, base $\frac{2}{3}$–$\frac{3}{4}$ amplexicaul, deeply decurrent-attenuate, subcoriaceous, glabrous, attenuate upward into tendril, longitudinal nerves 5–6 pairs, disposed as in *N. gracilis* all springing from leaf base, transverse veins ascending radiate; tendril 6–20 cm., delicate, slightly thickened toward pitcher, sparsely villose; lower pitchers small, ventricose, with ciliate wings, upper ventricose below, cylindric above, green or faintly pink-streaked, finely brown-spotted, wings 2-ciliate cords extending from base to mouth, mouth circular, slightly oblique; peristome narrow cylindric, finely ridged, lid cordate-orbicular, 2–2·5 cm., glabrous without, within with few scattered deeply sunk perithecioid glands, spur 3–4 mm., sparsely pubescent, pitcher within to $\frac{1}{2}$–$\frac{3}{4}$ depth glaucous-purple, smooth conducting, below with discrete exposed glands. *Inflorescence*: peduncle short, 1–3 cm., rhachis 10–12 cm. both ferrugineo-pubescent, pedicels slender, uniflorous, rarely biflorous below, ebracteolate. *Sepals* 4, elliptic to broad ovate, without puberulous to subglabrous, within densely glandular; male flowers with staminal column $\frac{1}{3}$ length of sepals, glabrous, anthers 6–8, female flowers with elliptic pubescent ovary of 4 rarely 3 carpels, stigmas 4–3 mm. thick. *Fruit* 2–2·5 cm. long, lanceolate, lobes 4 rarely 3, almost glabrous, with bilobed apex: seeds 14–15 mm. long, pale yellow.

Malay Peninsula: Singapore, Changi, *Ridley*! Malay Islands: Borneo, *Korthals* 7165! *Lowe*!; Bangarmassing, *Motley* 554!; Bocutok, *Winkler* 3277!; Jesselton, Kinabalu, *Clemens* 9588! 9687!; Banka, *Kurz* 1465!.

LVIII.—ADDITIONS TO THE FLORA OF MALAYA.

H. N. Ridley.

Xylopia rotundata *Ridl.* n. sp. [Anonaceae]; affinis *X. fuscae* Maing., sed foliis obovatis apicibus rotundatis, floribus majoribus, petalis linearibus acutis.

Arbor 13 metralis: *foliis* obovatis, apicibus rotundatis basibus attenuatis, tenuiter coriaceis, glabris, nervis tenuibus 7-paribus, 8 cm. longis, 4·4 cm. latis; petiolis 1·5 cm. longis; *floribus* singulis extra-axillaribus; *pedunculis* 8 mm. longis; *bractea* reniformi-rotundata 5 mm. lata; *pedicello* 5 mm. longo; omnibus pubescentibus; *sepalis* 3, late oblongis rotundatis 1 cm. latis pubescentibus; *petalis* 6 linearibus acutis basibus rotundatis dilatis pubescentibus, 2·5 cm. longis, superne 3 mm. latis; *staminibus* ad 30 cuneatis, apicibus planis subovatis; *ovariis* ad 4 pubescentibus.

Borneo. Siol, Kuching, on low-lying ground and slopes, *Foxworthy* 0357.

Tree, 40 feet tall, girth at breast-height 3 feet. Wood moderately hard, heartwood and sapwood distinct. Used for house-construction and dugouts. Native name: Pelan.

Hydnocarpus Humei *Ridl.* n. sp. [Flacourtiaceae]; affinis *H. Wrayi* King, sed floribus multo minoribus foliisque longe caudatis tenuibus.

Arbor 3 metralis glabra; *foliis* chartaceis ellipticis oblanceolatis longe cuspidatis, basibus attenuatis cuneatis, marginibus undulatis vel crenulatis vel versus apices parce serratis, nervis 8-paribus tenuibus arcuantibus elevatis, 18–20 cm. longis, 6–7 cm. latis (cuspide 3 cm. longo); petiolis 1 cm. longis; *floribus* masculis aggregatis in 2 ramis crassis in pedunculo crasso, panicula in toto 5 mm. longo, pedicellis crassiusculis 1 mm. longis; *sepalis* 4 rotundatis marginibus ciliatis 3 cm. longis; *petalis* 5, multo brevioribus, staminibus vix superantibus oblongis truncatis hirtis, intus glabris fuscis; *staminibus* 15, filamentis brevibus longe albo-pilosis; antheris oblongis, loculis connectivo disjunctis. *Flores feminei* et *fructus* ignoti.

Selangor. Klang Gates, *Hume* 7256.

Tree 10 feet tall. Flowers white. I know nothing very like this species, the foliage seems very variable, the edge sometimes quite entire and sometimes coarsely serrate in the upper third. The flowers resemble those of *H. Wrayi*, but are very much smaller.

Shorea chrysophylla *Ridl.* n. sp. [Dipterocarpaceae]; species *S. mecistopteryci* Ridl. affinis, sed foliis subtus aureo-pubescentibus distinctis.

Arbor 17 metralis ramulis scabrido-furfuraceis; *foliis* coriaceis oblongis obtusis, basibus cordatis, superne costa nervisque glabris, subtus aureo-pubescentibus velutinis, nervis 18-paribus cum costa elevatis, nervulis transversis copiosis parallelis paulo undulatis, reticulationibus minutis conspicuis, 27 cm. longis, 11·5 cm. latis; petiolis 5 cm. longis validis aureo-velutinis; *perulis* lanceolatis obtusis pubescentibus 2 cm. longis, 1 cm. latis, *paniculis* pauci-ramosis 1·2 cm. longis, ramis gracilibus pubescentibus; *bracteis* anguste oblongis 5 mm. longis; *pedicellis* 3 mm. longis; *sepalis* lineari-oblongis obtusis pubescentibus, tribus 5 mm. longis 2 minoribus; *petalis* et *staminibus* invisis; *ovarium* glabrum, stylopodio dilatato longiusculo.

Borneo. Pintasan, Tipuas, Tankulap, 600 feet alt,, 13th Oct. 1925, *Raphael B. Cabiling* 1, 6 (type).

Tree 50 feet tall, 40 inches in diameter. Leaves golden-velvety on the back. Flowers white, minute. Fruit (very young) reddish. Native names: Kawang Bukit; Kawang jantan.

A very distinct plant in the golden velvety underside of the leaves. Unfortunately all the specimens are in young fruit, the petals and stamens gone, and no fully developed fruit.

Sterculia microphylla *Ridl.* n. sp. [Sterculiaceae]; *S. parvifoliae*

Wall. affinis, sed foliis ovatis cuspidatis nec lanceolatis, floribus angustis infundibuliformibus differt.

Arbor 8–10 metralis glabra, ramis pallidis suberosis; *foliis* ovatis cuspidatis, basibus rotundatis tenuiter coriaceis nitidis, nervis 3-paribus inarcuantibus, 7–9 cm. longis, 3·5–4 cm. latis; petiolis gracilibus 4 cm. longis; *racemis* gracillimis puberulis 10 cm. longis; *floribus* rubris, dissitis; *pedicellis* filiformibus 1 cm. longis puberulis; *sepalis* tubo infundibuliformi hirto 1 cm. longo, lobis filiformibus hirtis aequilongis apicibus connatis; *androecio* brevissimo, stipite basi incrassato ad apicem attenuato, antherarum capitulo nutante, antheris 10 parvis oblongis. *Flores feminei* et *fructus* non visi.

Perak. Kali, Kuala Kangsar, *Haniff* 14943.

This curious species with its small, round, long-cuspidate leaves, and very slender racemes of scattered spider-like flowers is not closely allied to any species.

Sterculia Holttumii *Ridl.* n. sp. [Sterculiaceae]; *S. Scortechinii* King affinis, sed foliis majoribus oblongis haud punctatis.

Arbor 17 metra alta, glabra; *foliis* coriaceis oblongis obtusis vel breviter cuspidatis basibus latis obtusis, nervis subtus elevatis 7-paribus arcuantibus, nervulis subparallelis paucis, reticulationibus minutis, 11–14·5 cm. longis, 6 cm. latis; petiolis 2 cm. longis; *panicula* ramis 3 cm. longis; *pedicellis* 3 mm. longis: *sepalorum* tubo campanulato, ovoideo 2 mm. longo, lobis linearibus hirtis 2 mm. longis apicibus connatis: *androecii* stipite erecto tereti cylindrico, antheris 10 in seriebus duobus superpositis.

Trengganu. Pulau Kapas, *Holttum* 15214.

Tree 50 feet high; by the shore.

Ilex nitens *Ridl.* n. sp. [Ilicineae]; species *I. epiphyticae* King affinis, foliis integris, floribus in racemis brevibus, corollae tubo distincto staminibus longioribus.

Arbor?: *foliis* oppositis crasse coriaceis nitidis epunctatis oblongo-ellipticis obtusis vel elliptico-lanceolatis acutis superne costa nervisque depressis, subtus costa elevata; nervis 6-paribus indistinctis paullo elevatis, 9–9·5 cm. longis, 3·5–4·2 cm. latis; petiolis validis 1 cm. longis: *racemis* brevibus axillaribus 1 cm. longis; *bracteis* ad bases pluribus ovatis coriaceis 1 mm. longis: *floribus* 3 mm. longis circiter 6; pedicellis 2 mm. longis; *bracteolis* caducis oblongis obtusis: *sepalis* 4 ovato-rotundatis pubescente-ciliatis; *corolla* longiore, tubo sepalis aequilongo, lobis 4 rotundatis; *staminibus* 4, petala superantibus, filamentis teretibus, antheris subglobosis; *stylo* breviore, stigmate parvo pulviniformi

Pahang. Gunong Benom, 6000 feet alt., 7th Aug. 1925 (F.M.S. Mus. Coll.).

Allomorphia longisetosa *Ridl.* n. sp. [Melastomaceae]; species nullo arcte affinis, foliis oblanceolatis basibus obtusis, petiolis longe rufo-setosis; staminibus obtusis brevibus in appendiculatis distinctis.

Suffrutex; *caule* lignoso 12 cm. longo, 5 mm. crasso: *foliis* terminalibus oblanceolatis subacutis basibus obtusis subcordatis, marginibus crenato-serratis, superne sparse setosis, subtus in costa et nervis nervulisque setosis, nervis 2-paribus, nervulis transversis parallelis ad 30-paribus, 16–23 cm. longis, 5–8 cm. latis; petiolis validis 4 cm. longis, longe rufo-setosis, setis 1 cm. longis: *racemo* gracili 8 cm. longo glabro, rachide angulato; *floribus* in umbellis lateralibus parvis viride-flavis, pedicellis 5 mm. longis; calyce campanulato 1 mm. longo, 6-dentato: *petalis* minutis lanceolatis acutis: *staminibus* 8, filamentis brevibus filiformibus, antheris longioribus oblongis apicibus et basibus 1 mm. longis; *stylo* gracili 5 mm. longo; *capsula* rotundata, 3 mm. longa.

Johore. Gunong Pantai, 1500 feet alt., on rocks on ridges ; one foot high; flowers small, yellowish-green; *Holttum* 15050.

The foliage of this plant resembles that of *Pomatostoma* but the inflorescence is that of *Allomorphia*. The stamens, however, are short and the anthers bluntly oblong, not beaked as in most Allomorphias.

Hedyotis hirta *Ridl.* n. sp. [Rubiaceae]; herba *H. congestae* R. Br. similis, sed undique hirta, foliisque tenuioribus et subsessilibus, nervis valde inconspicuis.

Herba 90 cm. alta, basi repente; *caule* subangulato pubescente: *foliis* crassiusculis lanceolatis vel oblongo-lanceolatis superne glabris, subtus hirtis, 9 cm. longis, 3 cm. latis, nervis obscuris; petiolis 3 mm. longis, hirtis: *floribus* dense congestis in axillis pluribus brevissime pedicellatis; *bracteis* lanceolatis acuminatis brevibus hirtis; *calyce* oblongo-ovoideo lobis triangularibus acuminatis undique hirto: *corolla* 5 mm. longa, tubo gracili, lobis 4 linearilanceolatis acutis, capillis extus albis ad apices: *staminibus* 4, petalis paullo brevioribus, filamentis gracilibus glabris, antheris linearibus: *stylo* paullo breviore, stigmatibus 2 brevibus recurvis: *capsula* oblongo-ovoidea hirta, crustacea (in sicca), seminibus paucis angulatis nigris.

Southern Siam. Pungah, *Haniff & Nur* 3871.

This is quite of the style of the common *H. congesta*, but the leaves are thinner and the nerves almost invisible, and the whole of the plant except the upper surface of the leaves is hairy.

Ardisia viminea *Ridl.* n. sp. [Myrsineae]; species *A. marginatae* Bl. affinis, sed foliis et floribus multo minoribus.

Arbuscula glabra 7-metralis, ramis gracilibus vimineis: *foliis* angustis lanceolatis obtusis basibus angustatis, coriaceis punctatis, nervis pluribus ferme invisis, 7 cm. longis, 1·25 cm. latis; petiolis 0·5 mm. longis gracilibus: *cymis* terminalibus glabris paucifloris; *pedunculis* gracilibus rugosis subfurfuraceis 3·2 cm. longis, ramis paucis 5–10 mm. longis; *pedicellis* 2 mm. longis puberulis; *floribus* parvis albis; *sepalis* triangulari-lanceolatis glandulosis praesertim in marginibus; *petalis* ovatis brevibus acutis: *staminibus* antheris

subsessilibus pro flore majusculis: *stylo* breviore: *drupis* parvis globosis.

Selangor. Ulu Gombak; 20 feet tall, flowers white; *Hume* 9676.

The peduncles and pedicels are very rugose and almost scurfy.

Jasminum cordatum *Ridl.* n. sp. [Oleaceae]; affinis *J. subtriplinervi* Bl., differt foliis coriaceis cordatis, sepalis brevioribus, corollae lobis acutis.

Frutex scandens puberula: *foliis* simplicibus oppositis rigide coriaceis ovatis vel lanceolatis acutis, basibus cordatis, costa subtus prominente, nervis 2–4-paribus, 4–7 cm. longis, 2·5 cm. latis; petiolis 3 mm. longis: *floribus* 2 vel pluribus breviter pedicellatis: *pedicellis* 3 mm. longis puberulis; *sepalis* 6 subulatis 2 mm. longis: *corollae* tubo 2·5 cm. longo cylindrico, lobis 7 oblongis acutis, 1 cm. longis, 5 mm. latis, albis: *drupis* binis oblongis (immaturis).

Perak. Gunong Lenoh near Batu Gajah, 350 feet alt., on limestone, also found on the top of a ridge about 1000 feet alt., *G. R. Mills & M. R. Henderson* 15064.

Nearest to *J. subtriplinerve* Bl., of Khasiya and Sylhet, but the leaves are more coriaceous, distinctly cordate, the sepals much shorter and the petals acute; the leaves usually have two conspicuous pairs of nerves from the base and a little above, ascending and inarching within the edge, and some very inconspicuous usually invisible, transverse nerves from the midrib.

Voacanga Havilandii *Ridl.* n. sp. [Apocynaceae]; a *V. grandifolia* Rolfe differt floribus et foliis multo minoribus.

Frutex vel *arbor* parvus glaber: *foliis* lanceolatis vel ovato-lanceolatis acuminatis vel acutis carnosis, basibus angustatis, nervis 11–12-paribus ascendentibus, 9–18 cm. longis, 5·5 cm. latis; petiolis 1–1·5 longis: *paniculis* laxis patentibus pubescentibus 10 cm. longis, 15 cm. latis; *pedunculis* 9 cm. longis, pedicellis 1·5 cm. longis; *calyce* tubuloso obtuso breviter 5-lobo, 7 mm. longo: *corollae* tubo brevi calycem vix superante, annulo incrassato ad orem lobis 5 obovatis, apicibus rotundatis, basibus angustioribus, 2 cm. longis, 1 cm. latis ad apices: *staminibus* 5, antheris in ore sessilibus linearibus, sagittatis acutis: *carpellis* 2; *stylo* ad basin gracili, superne dilato, annulo sub-5-lobo denticulato ad apicem; *stigmate* obconico denticulato, disco annulari sub-5-lobo: *fructibus* non visis.

Borneo. Sarawak, *Beccari* 3601; Kuching, Rock road, *Haviland* 593 (type); Rejang, Sibu, *Haviland* 3047; Kuching, Sungei Sinjan, Siol, hilly districts, 14 feet tall, girth at breast-height 3 feet, bark thin, wood white, fine-grained (Foxworthy's collector 396). Native name: Kayu susu.

Aeschynanthus Flippancei *Ridl.* n. sp. [Cyrtandraceae]; species affinis *A. amoenae* Clarke, sed foliis ovatis tenuibus omnino diversa, corolla brevi pubescente, calyce tubuloso, lobis brevibus.

Herba scandens radicans glabra; *foliis* binis oblongo-ovatis obtusis basibus rotundatis, subcoriaceis, nervis in pagina superiore 4-paribus indistinctis, subtus invisis, 5 cm. longis, 1·5 cm. latis, *petiolis* 8 mm. longis; *floribus* axillaribus, 2–3 in racemo brevissimo crasso 3 mm. longo, *bracteis* per-parvis ovatis; *pedicellis* 5 mm. longis; *calyce* tubuloso, lobis brevibus 5-ovatis acutis, 1 cm. longo, 4 mm. lato, glabro viridi; *corolla* brevi rubra pubescente 2 cm. longa, tubo crassiusculo calycem vix superante, lobis ovatis brevibus; *staminibus* exsertis pubescentibus 2·5 cm. longis, antheris oblongis, *stylo* breviore.

Penang. Balik Pulau, *Flippance*.

This plant judging from a few slender roots emitted from the stems appears to be more or less of a creeping plant, like *Aeschynanthus radicans*. It is remarkable for the short corolla, only twice as long as the tubular calyx, and the flowers few in number borne on a short thick raceme.

Didissandra breviflora *Ridl.* n. sp. [Cyrtandraceae]; species *D. Wrayi* Ridl. affinis, sed haud hirta foliis superne glabris.

Suffrutex, caule lignoso 6–10 cm. longo superne dense pallide brunneo-lanuginoso; *foliis* oblanceolatis acutis, basibus cuneatis, marginibus dense serratis, superne glabris, subtus nervis 26-paribus cum costa hirto-lanuginosis, 6–11 cm. longis, 2·5–3 cm. latis; petiolis lanuginosis 2 cm. longis decurrentibus: *pedunculis* gracillimis 7 cm. longis hirtis unifloris: *sepalis* linearibus obtusis 3 mm. longis: *corolla* campanulato-tubulosa glabra pallide coerulea 1 cm. longa, limbo 1 cm. lato, lobis rotundatis: *staminibus* non visis: *pistillo* glabro 7 mm. longo.

Selangor. Ulu Gombak, 500 feet alt., *Hume* 8437.

I have only seen one crushed flower of this plant and am unable to see the stamens. The leaves are decurrent for some way on the petiole. The flower is shorter and more campanulate than in any other species of the genus.

Gymnostachyum hirtum *Ridl.* n. sp. [Acanthaceae]; species *G. affini* Nees proxima, differt ab omnibus specibus in foliis et spica hirtis, sepalisque majoribus.

Herba, caule brevi lignoso hirto; *foliis* lanceolatis subacutis basibus cuneatis, marginibus crenulatis hirtis, superne costa excepta glabris, subtus papillosis, costa nervisque 9 ad 11-paribus appresse hirtis; 7–12 cm. longis, 2–4 cm. latis; petiolis 1–2·5 cm. longis hirtis; *spica* 21 cm. longa hirta, basi (8 cm.) nuda; *floribus* circiter 12 sessilibus; *bracteis* lanceolatis acuminatis longe hirtis 1 cm. longis; *sepalis* lanceolatis acuminatis hirtis 1 cm. longis: *corolla* alba, 1·5 longa, pubescente, tubo 3 mm. longo, lobis lanceolatis: *staminibus* non visis: *stylo* filiformi pubescenti: *capsula* oblonga obtusa 8 mm. longa.

Perak. Kali, Kuala Kangsar, *Haniff* 14936. Flowers white.

This is one of the short-stemmed unbranched species, which

differs from all the others in the nerves of the leaf, the sepals and the whole spike being covered with long rough hairs.

Justicia trichodes *Ridl.* n. sp. [Acanthaceae] ; species *J. secundiflorae* Ridl. affinis, sed bracteis lanceolatis vel ovatis latioribus hirtis omnino distincta.

Herba 20–25 cm. alta pubescens; *foliis* herbaceis ovatis vel lanceolatis acuminatis, basibus acutis vel attenuatis acutis, superne glabris, subtus in nervis 6-paribus et costa hirtulis, 8–10 cm. longis, 1 cm. latis; petiolis 2 cm. longis pubescentibus: *spicis* in axillis terminalibus 1 ad 3, 6–6·5 cm. longis; *pedunculis* 0·5–1 mm. longis pubescentibus; *bracteis* pluribus sessilibus imbricantibus, basalibus lanceolatis, superioribus ovatis acutis dense hirtis, basibus breviter angustatis, 8–10 mm. longis, 4 mm. latis: *floribus* flavis, sessilibus: *sepalis* anguste lanceolatis hirtis; *corolla* 1·5 cm. longa, tubo cylindrico basi subglabro superne sparse hirto 7 mm. longo, lobis subaequilongis, labio superiore oblongo-lineari angusto extus hirto, apice breviter obtuse bilobo, labio inferiore aequilongo extus hirto, apice dilatato.

Selangor. Semeniyih, 8 inches high, *Hume* 8165; flowers yellow, 10 inches high, *Hume* 7816 (type).

There is only a single flower on each specimen, and I have therefore been unable to examine it as fully as I should like.

Beilschmiedia longipedicellata *Ridl.* n. sp. [Laurineae]; *B. Scortechinii* Gamble affinis, sed panicula laxa pedicellis longis.

Arbor 10 metralis, ramis juvenibus hirtis; *alabastris* rufo-velutinis: *foliis* coriaceis obovato-oblongis breviter cuspidatis, basibus obtusis superne glabris, subtus costa nervisque circiter 14-paribus hirtis elevatis, 20 cm. longis, 10 cm. latis; *petiolis* 2 cm. longis hirtis: *paniculis* laxis patentibus paucifloris hirtis; *pedunculis* 5–7 cm. longis, ramis 3 cm. longis; *floribus* 3 vel 4 pseudo-umbellatis, *pedicellis* 2 cm. longis; *bracteis* oblongo-linearibus rufo-hirtis: *sepalis* 6 ovatis acutis paullo hirtis 2 mm. longis: *staminibus* serie exteriore 6, filamentis oblongo-linearibus latis, antheris bilocularibus, introrsis glabris; serie secunda 6, filamentis crassis carnosis angustioribus, antheris extrorsis (ut apparet sterilibus); *staminodiis* ovatis sessilibus carinatis glabris: *ovario* hirto ovoideo; *stylo* brevi crasso, stigmate discoideo.

Selangor. Semeniyih, 30 feet high, *Hume*.

This is very distinct from any species known to me in its lax panicle with long-pedicelled flowers, it is also unusually hairy for a *Beilschmiedia*. The flowers are sparsely and shortly hairy outside and somewhat hairy inside.

Buxus malayana *Ridl.* n. sp. [Euphorbiaceae]; species *B. molliculae* W. W. Sm. affinis, sed omnino glabra, capsulis majoribus, stylis longioribus.

Frutex subglabra, ramis angulatis, angulis demum suberosis: *foliis* oppositis rigide coriaceis ovato-lanceolatis obtusis, basibus

cuneatis marginibus incrassatis, nervis 17-paribus, superne vix distinctis, subtus invisis, 3–7 cm. longis, 1–3·3 cm. latis; petiolis 2 mm. longis: *floribus* in capitulis terminalibus 1 cm. latis, congestis; *bracteis* coriaceis lanceolatis, masculis 3 vel 4 basalibus, femineo uno terminali; floribus *masculis*, *sepalis* oblongis coriaceis 3 mm. longis obtusis, *staminibus* 4 e disco parvo, filamentis linearioblongis acuminatis paullo longioribus, antheris dorsifixis curvis; *flore femineo*, *pistillo* conico, stylis 3, stigmatibus recurvis linearibus: *capsulis* ovatis laevibus, 1 cm. latis, stylis 0·5 mm. longis 6.

Perak. Gunong Lanok, near Batu Gajah, 1000 feet alt., on limestone, *G. R. Mills & M. R. Henderson* 15078.

This beautiful Box-bush does not really resemble any known species, but has more of the habit of *B. mollicula* Sm. of Thibet. It is, however, perfectly glabrous and the styles on the capsule much longer. The only other species of box in our area is the quite dissimilar little *B. rupicola* of Lankawi. The genus appears to be quite absent from the Malay Archipelago except for the *B. Rolfei* of the Philippines.

Sauropus elegantissimus *Ridl.* n. sp. [Euphorbiaceae]; *S. concinno* Hemsl. affinis, sed foliis multo minoribus, sepalis haud bilobis apicibus retusis latioribus, planta multo majore.

Arbuscula 5 metralis, glabra, ramis gracilibus, ramulis gracillimis: *foliis* alternis herbaceis ovatis obtusis subtus glaucescentibus basibus rotundatis; nervis 3-paribus, 9 mm. longis, 5 mm. latis; petiolis gracilibus 1 mm. longis; *bracteis* ad bases ramorum coriaceis triangularibus acutis; *stipulis* lanceolatis acuminatis: *floribus* axillaribus flavis 4 mm. latis; *pedicellis* 2 mm. longis; *floribus masculis* non visis; *floribus femineis*, *sepalis* 5 ferme ad basin liberis carnosis oblongis truncatis, apicibus latis subretusis mucronulatis; *ovario* crasso apice plano depresso, subtrilobo; *stylo* crasso, brevi; stigmatibus 3, bifidis, lobis curvis.

Selangor. Ulu Gombak, *Hume* 9366.

Tree 15 feet, flowers yellow.

This very elegant species with its numerous small leaves is nearest *S. concinnus* Hemsl. of Burma, but it is a much bigger plant, the leaves much smaller, and the sepals are retuse with a small mucro.

Galearia lancifolia *Ridl.* n. sp. [Euphorbiaceae]; species *G. Finlaysonii* Wall. affinis, foliis anguste lanceolatis ab omnibus speciebus differt.

Arbor 5 metralis, ramis pubescentibus vel hirtis: *foliis* coriaceis lanceolatis acuminatis, basibus rotundatis glabris superne politis eveniis, subtus nervis 13-paribus elevatis inter se arcuantibus, nervulis et reticulationibus elevatis, 20 cm. longis, 3·5 cm. latis; *petiolis* 3–4 mm. longis hirtis; *spicis* masculis 40 cm. longis gracillimis hirtis; *floribus* minutis albis sessilibus in fasciculis; *bracteis* minutis; *sepalis* lanceolatis hirtis; *petalis* cymbiformibus oblongis, apicibus incurvis glabris; *staminibus* glabris; *spica feminea* cras-

siore 13 cm. longa hirta; *bracteis* lanceolatis subulatis 2 mm. longis; *fructibus* viridibus reniformibus glabris, 7 mm. longis 1·5 cm. latis.

Selangor. Klang Gates, *Hume* 7146: Ulu Gombak at 1500 feet alt., tree to 15 feet tall, flowers white, *Hume* 9931 (type).

This is most nearly allied to *G. Finlaysonii* Wall., but the narrow lanceolate leaves are unique in the genus.

Boehmeria irritans *Ridl.* n. sp. [Urticaceae]; *B. platyphyllae* Don approximata, differt in paniculis racemisque foliis multo brevioribus, glomerulis distantibus, floribus masculis glabris, femineis sessilibus brevioribus et latioribus.

Frutex vel *arbor* 6 m. alta, *caule* superne hirto; *foliis* alternis ovatis acuminatis acutis, basibus rotundatis minute cordatis marginibus crenatis, superne glabris, minute punctatis, subtus pallidis hirtis, nervis subtus elevatis 5 ad 6-paribus, nervulis transversis undulatis, reticulationibus sub lente conspicuis, 11–16 cm. longis, 4–12 cm. latis; *petiolis* 5 cm. longis hirtis: *paniculis* vel *racemis* axillaribus pubescentibus 4–5 cm. longis, glomerulis plurimis, 2–3 mm. latis; *floribus* sessilibus; *bracteis* oblongo-ovatis hirtis, ciliatis; *floribus masculis* 1 mm. longis subglabris; *sepalis* 4 tenuibus oblongis obtusis; *staminibus* 4 filamentis gracilibus; antheris reniformibus; *floribus femineis* perianthio utriculiformi dentibus 4 minutis hirto; *ovario* subtriquetro; *stigmate* singulo crasso cylindrico decurvo; *achenio* ovato triquetro vel fusiformi (in utriculo) pubescente viscido.

Christmas Island, *Andrews* 60; Flying fish cove, Phosphate Hill, *Ridley* 156a (type).

This plant which stings as badly as *Laportea* was originally referred to *B. platyphylla* Don, from which it differs in its urticating hairs and shorter panicles of racemes or simple racemes, the glabrous male flowers and shorter, thicker female flowers. It is often a small tree, 18 feet tall, and has quite a different habit from any form of *B. platyphylla* Don.

Bulbophyllum cheiropetalum *Ridl.* n. sp. [Orchidaceae]; species *B. epicrianthi* Hook. fil. affinis, sed pseudo-bulbis magis dissitis foliis majoribus, petalis quadrifidis, lobis linearibus acutis nec clavatis.

Epiphyta, *pseudo-bulbis* cylindricis 1 cm. longis et 1–1·5 cm. dissitis, vaginis papyraceis argentatis tectis; *folio* lanceolato acuminato, basi angustato coriaceo 5 cm. longo, 1·5 cm. versus basin lato; *floribus* singulis axillaribus, pedicellis 5 mm. longis; *sepalis* coriaceis ovato-lanceolatis acuminatis punctatis 6 mm. longis, basi gibbosis; *petalis* aurantiacis dimidio brevioribus e basi brevissimo 4-fidis, lobis linearibus acuminatis uno minore; *labello* linguiformi carnoso, obtuso brevi, basi lobis 2 rotundatis tenuibus; *gynostemio* brevi, pede longiore, stelidiis brevibus obtusis; *anthera* oblonga, rostro oblongo truncato; *capsula* elongata angusta 2 cm. longa, pedicello 1 cm. longi.

Kedah Peak, 3000 feet alt., 10th July, 1925, *Flippance*.

This plant belongs to the section *Epicrianthes*, but differs in its much larger size, and the curious 4-fingered petals, linear and acute, three of the fingers being longer than the outer one. The photograph sent shows the sepals spotted and the petals appear from the dried specimen to be yellow or orange.

Saccolabium macrantherum *Ridl.* n. sp. [Orchidaceae]; species in forma antherae malleiformis omnino ab aliis specibus distincta.

Epiphyta, caule 1 cm. longo: *foliis* 3, oblongo-ellipticis obtusis, 7 cm. longis, 3 cm. latis vel minoribus sessilibus: *racemo* gracili 9 cm. longo basi 1·5 cm. nudo; *floribus* per-parvis dissitis albis circiter 36; *bracteis* lanceolatis subulatis 1 mm. longis, *pedicellis* 2 mm. longis: *sepalo* postico lanceolato acuto subcymbiformi curvo 2 mm. longo, lateralibus oblongis apicibus rotundatis; *petalis* oblongis obtusis, angustioribus; *labello* deflexo, 4 mm. longo ad apicem calcaris, lobis lateralibus oblongis erectis subtruncatis brevibus, lobo medio longiore lineari carnoso, callis nullis; *gynostemio* erecto, clinandrio elongato horizontali; *anthera* ovata, apice bilobo, rostro elongato lanceolato acuto; *polliniis* 2 globosis, pedicello longo quam sepalis longiore, apice triangulari tridentata infra elongato angustissimo, disco lineari; *stigmate* angusto inter alis duobus paullo elevatis, callo brevi cylindrico ad basin stigmatis deflexo.

Selangor. Ulu Gombak, 1800 feet alt., flowers white, *Hume*.

I know no *Saccolabium* with so peculiar a column as this; the base is erect and comparatively short, but the clinandrium is prolonged horizontally in both directions, giving a hammer-like form to the whole, the anther cap is large for the flower, bilobed above the pollen-masses, and the pedicel runs the whole length of the prolonged clinandrium and is actually longer than the sepals. It should perhaps be generically separated.

Digitaria virens *Ridl.* n. sp. [Gramineae]; species *D. barbatae* Willd. affinis, sed gluma exteriore multi-costata marginibusque albo-hirtis, planta minore, spiculis minoribus angustioribus, capillis in marginibus brevibus.

Herba caespitosa 20–30 cm. alta: *foliis* glabris linearibus acuminatis 4·5–10 cm. longis, 3 mm. latis, ligula brevi oblongo-lanceolata obtusa, vaginis pilis albis paucis ad bases; *racemis* 2 vel 3 gracilibus 6–7 cm. longis, rachide tenui undulato, anguste alato: *spiculis* lanceolatis acutis 3 mm. longis, vix 1 mm. latis, *gluma* I lanceolata acuta multi-costata (costis ad 12) pallide brunnea, marginibus pilis albis minutis; *gluma* II aequilonga tenui plana acutiore aliter simili; *palea* plana ferme aequilonga: *staminibus* 3, antheris linearibus, utrinque obtusis; *caryopsi* translucente pallido oblongo-elliptico 1·5 mm. longo.

Christmas Island. Flying fish cove, Phosphate Hill to the Waterfall, *Ridley* 97, 154 (type).

I had classed this with *Digitaria commutata*, but Dr. Stapf noted on the specimens that it was an undescribed species, and

indeed it is very distinct in the outer glume of the spikelet being closely ribbed, and in its margins being provided with rather long white hairs, not conspicuous till the fruit is ripe. I noticed at the time I gathered it that the leaves were unusually bright green, hence its specific name. It is certainly allied to *D. barbata* Willd. but the racemes and spikelets are much smaller, and the white hairs on the glume edge scantier and much shorter.

LIX.—THE GENUS ENGLERASTRUM. J. Hutchinson and J. E. Dandy.

A revision of the genus *Englerastrum* was recently carried out by Alston and appeared in *Kew Bull.* 1926: 295. It transpires, however, that a revision was published two years earlier by Th. C. E. Fries in *Notizbl. Bot. Gart. Berl.* 9: 61 (1924). Comparison of the two revisions shows that the conceptions of the genus held by Alston and Fries are decidedly different, and it is therefore necessary to correlate their results.

Alston in his revision deals with *Englerastrum* Briquet, i.e., a genus characterised by the subequal calyx-teeth, connate filaments, and distinctive habit of *E. Schweinfurthii* Briquet. Fries on the other hand enlarges the genus to include several species of *Plectranthus*, and the group of plants revised by him is *Englerastrum* Briquet, emend. Th. C. E. Fries. Alston mentions that *Englerastrum* approaches *Plectranthus* closely, but is distinguished by its connate stamens and peculiar habit. Fries, however, finds that some species of *Plectranthus* have filaments connate at the base, and on that account extends the limits of *Englerastrum* to contain them. These species of *Plectranthus* undoubtedly approach *Englerastrum* very closely; it is therefore difficult to determine where one genus ends and the other begins, and the line of division between them must necessarily be somewhat artificial. It seems better to limit *Englerastrum* to Briquet's original conception by including only those species whose calyx is actinomorphic or almost so, even in fruit. Fries places the two previously known species of *Englerastrum* in a subgenus *Eu-Englerastrum*, characterised by a regular calyx, and founds a second subgenus *Heterodon*, in which the calyx is manifestly zygomorphic, to receive those species of *Plectranthus* which have connate stamens. Most of the latter species differ from *Englerastrum* in habit as well as calyx, and their inclusion tends to destroy the homogeneity of that genus. He apparently overlooked the superior claims of *Coleus scandens* and *C. elongatus* to inclusion in *Englerastrum*. With the exception of one species, *E. diffusum*, which falls into the subgenus *Heterodon*, the genus *Englerastrum* as revised by Alston corresponds with Fries' subgenus *Eu-Englerastrum* and conforms with Briquet's original description of the genus. The species forming the sub-

genus *Heterodon*, including *E. diffusum*, are here transferred to *Plectranthus*.

In Fries' revision, *Englerastrum rhodesicum* N.E.Br. is not mentioned. Examination of the material from Berlin shows that *E. rhodesicum* is conspecific with a number of plants gathered by various collectors in Togoland, Cameroons, Congo, and Tanganyika. All these specimens are named by Fries as *E. djalonense* A. Chev., the type of which was seen by neither Alston nor Fries. The plants, however, fit the description of Chevalier's species, and *E. rhodesicum* is accordingly regarded here as synonymous with *E. djalonense*.

The following key and enumeration of the species are revised in accordance with the views expressed above. Several adjustments in nomenclature are entailed.

Clavis Specierum.

Racemi laxi; folia sessilia vel subsessilia, integra vel crenata, subpersistentia:
- Racemi subsimplices; folia plerumque ovata, margine crenata:
  - Florum verticillastra 1–4 mm. inter se distantia; radix ramosa.....1. *Schweinfurthii*.
  - Florum verticillastra 5–20 mm. inter se distantia; rhizoma subterraneum .....2. *Alstonianum*.
- Racemi ramosi; folia subintegra:
  - Folia ovata vel suborbicularia, apice obtusa .....3. *djalonense*.
  - Folia obovato-lanceolata, apice acuta ...4. *Hutchinsonianum*.

Racemi compressi, unilaterales; folia plerumque longe petiolata, crenata, caducissima (in *E. nigerico* ignota):
- Flores pedicellati; caulis minute puberulus.....5. *nigericum*.
- Flores subsessiles:
  - Caulis minute puberulus; flores pallide purpurei (*Trimen*); folia ovato-triangularia, subacuminata .....6. *elongatum*.
  - Caulis pilosus; flores caerulei (*Guerke*); folia rotundato-ovata, acuta .....7. *scandens*.

1. **Englerastrum Schweinfurthii** *Briquet* (excl. syn. *Coleus dissitiflorus* Guerke).

2. **Englerastrum Alstonianum** *Hutch. et Dandy*, nom. nov.—*E. Schlechteri* (Guerke) Alston, non Th. C. E. Fries.

3. **Englerastrum djalonense** *A. Chev.*—*E. rhodesicum* N.E. Br.

The following are additional records:—Togoland: Sokode-Farm, 350 m., *Schroeder* 66. Cameroons: Mashita, dry savannah, 750 m., *Ledermann* 5349. Belgian Congo: Mukenge, *Pogge* 1228, 1250. Rhodesia: near Mumbwa, *Macaulay* 637; Livingstone, in sand, 1000 m., *Rogers* 7205. Tanganyika: Kyimbila, Bundali, *Stolz* 1291.

4. **Englerastrum Hutchinsonianum** *Alston*.

5. **Englerastrum nigericum** *Alston*.

6. **Englerastrum elongatum** (*Trim.*) *Alston.*

7. **Englerastrum scandens** (*Guerke*) *Alston.*

Species Exclusae.

Englerastrum adenophorum (Guerke) Th. C. E. Fries = **Plectranthus adenophorus** *Guerke.*

Englerastrum conglomeratum Th. C. E. Fries = **Plectranthus conglomeratus** *Th. C. E. Fries*, mss., comb. nov.

Englerastrum diffusum Alston = **Plectranthus tenuis** *Hutch. et Dandy*, nom nov.*

Englerastrum floribundum (N.E. Br.) Th. C. E. Fries = **Plectranthus floribundus** *N.E. Br.*

Englerastrum gracillimum Th. C. E. Fries = **Plectranthus gracillimus** *Th. C. E. Fries*, mss., comb. nov.

Englerastrum Hjalmarii Th. C. E. Fries = **Plectranthus Hjalmarii** (*Th. C. E. Fries*) *Hutch. et Dandy*, comb. nov.

Englerastrum Kassneri Th. C. E. Fries = **Plectranthus Kassneri** (*Th. C. E. Fries*) *Hutch. et Dandy*, comb. nov.

Englerastrum melanocarpum (Guerke) Th. C. E. Fries = **Plectranthus melanocarpus** *Guerke.*

Englerastrum modestum (Baker) Th. C. E. Fries = **Plectranthus modestus** *Baker.*

Englerastrum Schlechteri Th. C. E. Fries = **Plectranthus Schlechteri** (*Th. C. E. Fries*) *Hutch. et Dandy*, comb. nov.

Englerastrum tetragonum (Guerke) Th. C. E. Fries = **Plectranthus tetragonus** *Guerke.*

LX.—ADDITIONS TO THE INDEX KEWENSIS: IX†

1. Crantz, Classis Umbelliferarum Emendata (1767).

In Kew Bulletin 1925, p. 186, a list was given of fifty names published in Crantz, Classis Cruciformium (1769), but hitherto omitted from the Index Kewensis. During the preparation of Supplement VII. it has been discovered that numerous names published in another work by the same author, namely, Crantz, Classis Umbelliferarum Emendata (1767) had also been omitted from the Index Kewensis. As in his work on Cruciferae, Crantz gave no indication of the authors of the species or whether a name was proposed for the first time in this work. It was, therefore, found necessary to check all the names, 217 in number, with the Index Kewensis and its Supplements. Of these, twenty names are either omitted from the Index Kewensis altogether or are

* The name *Plectranthus diffusus* has already been used by Merrill for a Philippine species.

† Continued from *Kew Bull.* 1926, p. 214.

ascribed to later authors. The Linnean equivalents were not cited by Crantz, and have therefore been determined by comparing the pre-Linnean synonyms cited by both Crantz and Linnaeus. Three of these names are kept up by modern authors, namely, *Caucalis nodosa*, *Chaerophyllum Anthriscus*, and *Laserpitium Halleri*. These were attributed in the Index to Scopoli, Lamarck and Allioni respectively. Of the remaining seventeen, five are nomina abortiva, namely:—*Apium ammi-maius*, *Apium Ammios*, *Apium Tragoselinum*, *Libanotis galbanifera*, *Smyrnium hispidum*.

The following list gives the twenty names in alphabetical order, each name being followed by the page of Class. Umbell. Emend. and its synonym:—

Apium
- ammi-maius 103 : Ammi maius
- Ammios 103 : Sison Ammi
- Tragoselinum 100 : Pimpinella Saxifraga

Caucalis
- Carota 113 : Daucus Carota
- nodosa 112 : Tordylium nodosum

Chaerophyllum
- Anthriscus 76 : Scandix Anthriscus
- canadense 79 : Sison canadense

Cicuta
- graeca 97 : Sium graecum
- Monnieri 98 : Selinum Monnieri

Laserpitium
- Halleri 67 : L. Halleri All. (1785)

Libanotis
- condensata 106 : Athamanta condensata
- galbanifera 107 : Bubon Galbanum
- sicula 106 : Athamanta sicula

Ligusticum
- chinense 81 : Athamanta chinensis
- Foeniculum 82 : Anethum Foeniculum

Selinum
- alpestre 60 : Peucedanum alpestre
- nodosum 61 : Peucedanum nodosum
- Silaus 61 : Peucedanum Silaus

Smyrnium
- hispidum 73 : Cachrys sicula
- Libanotis 72 : Cachrys Libanotis

2. An overlooked generic name.

Coutinia illustris, a new genus and species of the *Contortae* from Brazil, proposed by Velloso in a little-known work entitled Quinografia Portugueza (1799), seems to have been entirely overlooked by botanists. The description (pp. 166-170) is accompanied by two plates. Both description and plates leave no room for doubt that *Coutinia* belongs to the *Apocynaceae*. The fruit and seed are evidently those of an *Aspidosperma*. The flowering branch, however, is unlike any *Aspidosperma* hitherto discovered and is probably a *Plumeria*, the few flowered inflorescence, the two large bracteoles and the large flowers being characteristic of the

latter genus. Whether *Coutinia* is a mixture of two genera or not, it cannot replace either *Plumeria*, which dates from 1753, or *Aspidosperma* (1824), as the latter name is conserved under Art. 20 of the International Rules.

M. L. G.

LXI.—A NEW VARIETY OF ANDROSACE MAXIMA.

B. Gilliat-Smith.

A. maxima *L.* var. **flavida** *Gilliat-Smith* var. nov.; omnibus partibus tenuior, et floribus minoribus flavidis ab speciei varietate vulgare recedit. Corollae color *Primulae acaulidis* formae flavidae colori similis.

Persia. Tabriz, *Gilliat-Smith* 1326 (standard), 1359, (Herb. Kew.).

On the arid hills south of Tabriz, where it is always smaller than even the dwarf forms of the common variety of the species. It flowers from the latter half of March in sheltered places on the plain, and a fortnight later up in the hills. On the whole it appears earlier, and is more abundant, than the standard variety of the species, and continues flowering with the latter throughout April and the greater part of May. It fruits in May and June, the fruit being scarcely ripe before July.

LXII.—MISCELLANEOUS NOTES.

Mr. F. N. Howes, M.Sc., F.L.S., Economic Botanist, Agricultural Department, Gold Coast, has been appointed by the Minister of Agriculture and Fisheries to be an Assistant (Museums) in the Royal Botanic Gardens, Kew (*K.B.* 1925, p. 94.).

Mr. W. Nowell, D.I.C., F.L.S., Director, Department of Science and Agriculture, British Guiana, has been appointed by the Secretary of State for the Colonies, Director of the Amani Institute, Tanganyika Territory (*K.B.* 1913, p. 359; 1920, p. 218; 1926, p. 368).

The following appointments have been notified by the Secretary of State for the Colonies:—Mr. F. L. Squibbs to be Assistant Curator, Botanical Department, Dominica: Mr. T. D. Maitland, M.B.E., Botanist, Agricultural Department, Uganda, to be Superintendent, Botanic Gardens, Victoria, British Cameroons (*K.B.* 1910, p. 64; 1913, p. 125; 1921, p. 171): Captain H. G. Poynter, to be a Superintendent of Agriculture, Nigeria.

Dominica.—On the 22nd of July last a severe storm occurred over the island of Dominica. In a letter recently received, Mr. Harcourt, the Curator and Agricultural Superintendent, states that considerable damage was caused to the ornamental section of the Botanic Garden; five trees were completely destroyed and thirty-seven others sustained injury by being blown about so as to loosen their hold in the ground or by the loss of large limbs. In the economic nurseries and experiment plantations the damage was more serious. The whole shelter protecting the nursery collapsed and hundreds of young economic plants, ready for distribution to peasant proprietors, were destroyed. It will be several months before these stocks can be replenished. In the Lime Experiment Station many full-bearing lime trees were totally destroyed, a large quantity of the fruit was washed into the sea and even young fruits no larger than a pea were stripped from the trees. A serious gap has thus resulted in the continuity of the experimental work which has been in progress for a number of years. The result of the work carried out during the past year on the breeding of lime-trees with the object of obtaining a strain immune to the wither-tip disease was ruined, only one fruit set by the crosses surviving the storm. The Cacao trees, which were in full flower at the time, were stripped of their blossoms, the crop was entirely lost and many trees destroyed. Fruit trees generally were damaged and a large quantity of immature fruit destroyed.

The Study of Vegetation.*—This publication is by the British Empire Vegetation Committee, which was appointed by the Imperial Botanical Conference held in London in 1924. It is divided into three parts, General, Regional, and Types of Vegetation. The first deals essentially with ecological methods, terminology, the physico-chemical investigation of the habitat, biotic factors, and special groups of plants. The second part consists of five papers, by as many authors, dealing with vegetation study in various parts of the Empire. The last part is composed of eight papers, each complete in itself, by specialists on vegetational types characteristic of the different Dominions and India.

The methods of study of the main groups of factors which mould vegetation are mostly summarized in a concise manner which is, however, sufficiently detailed for students with a general scientific training to be able to work the processes in the field without the aid of other guides.

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* Aims and Methods in the Study of Vegetation, edited by A. G. Tansley and T. F. Chipp. The British Empire Vegetation Committee and the Crown Agents for the Colonies, 4, Millbank, Westminster, S.W. 1., 1926. Demy 8vo, pp. xvi + 384 with 62 figs. and plates. Price 12s. 6d.

The accounts of concrete study of various regions and types of vegetation from an ecological standpoint are naturally very varied. They certainly suffice to indicate the wide scope of the science, the material available for many workers, and the variety of methods and basic schemes which may be used.

This book, which is extraordinary good value for the price, should be in the hands of every student of vegetation in the British Empire. Beginners will find it the best introduction to the study of plant ecology yet published and even professional ecologists will find it useful.

Cotton and its Production.*—This book by Mr. W. H. Johnson bears an Introduction by Sir Wyndham R. Dunstan (late Director of the Imperial Institute), and also a Foreword by Sir William Himbury (Managing Director of the British Cotton Growing Association), both eminent authorities on the subject, while the author himself brings to bear on his work an experience befitting the importance of the task. The scope of the book is stated in the Introduction: "Mr. Johnson explains the present position and prospects of cotton cultivation in every country in which there is any chance of success, and his book furnishes the most complete guide and encyclopaedia which has yet appeared."

The first two chapters deal with the History and Botany of the Cotton plant. Then follow chapters on production in the six largest Cotton producing countries of the world—the United States, India, Egypt, Brazil, China and Russia. Evidence is given of the great efforts being made to increase production in other parts of the British Empire, namely Africa, Malaya, the West Indies, Australia, Ceylon, Iraq, etc. All branches of the industry are treated in detail and maps are included showing the areas of production. Cultivation, manufacture, diseases, insect pests and by-products are dealt with on a comprehensive scale, and an extensive bibliography and index conclude the work.

J. H. H.

Gum Arabic.†—The recent publication of a work entirely devoted to Gum Arabic or Gum Senegal (*Acacia Senegal* Willd.; *A. Verek* Guill. & Perr.) establishes the importance of the main trade product of an extensive tract of the Sudan region.

The Kordofan Province, from which comes about two-thirds of the gum exported from the Sudan, covers some 119,000 sq.

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* By W. H. Johnson, pp. xxvii+536, 26 maps. Macmillan & Co., Ltd., London, 1926. Price 30s.

† Gum Arabic; with special reference to its Production in the Sudan, by H. S. Blunt; pp. 47, map, ill. 50. Oxford University Press. London; Humphrey Milford. 1926. Price 10s. 6d. net.

miles, and the trade involves a circulation amongst the Arabs of £E.500,000 to 750,000 annually in the four gum-markets of El Obeid, Nahud, Um Ruaba and Rahad. Throughout this Province the Forestry staff exercise control, distributing seed, encouraging the cultivation, preventing illicit cutting down of the trees, keeping down fires and supervising the markets. The best gum areas are reported to be in comparatively waterless regions, and only high prices for the gum will induce the Arabs to go so far afield to collect it; they prefer to confine their attention to gum-gardens near the villages and a market. Water is the principal problem in the gum region and the chief supplies are obtained by means of (1) wells, usually 60 to 100 feet deep, (2) "Tebeldi" (Baobab Tree—*Adansonia digitata*) storage, (3) the cultivation of water-melons (*Citrullus vulgaris*), which are invaluable when men are out tapping distant areas. The Tebeldi trees, which are sometimes 40 ft. in circumference, are naturally or artificially hollowed out to hold about 70 burma (a pottery receptacle holding about $3\frac{1}{2}$ gallons), or approximately 250 gallons of water. There are some 33,000 of these trees used for holding water, and each tree has a name and is carefully guarded by its owner. The gum trees are found to be best grown from seed, which is produced only about once in five years, and the production of gum from each tree is estimated to lie between the fourth and eighteenth years.

The illustrations—50 in all—are an important feature of the book, which in general deals with History of the Trade, the Kordofan Province, Exploitation, Markets, Forest Policy, and Chemical Properties and Uses of the Gum.

It may be mentioned that there is a specimen of the tree with a tapping axe, also a good series of the gum, in the Museum collection at Kew.

J. H. H.

The Cultivation of Citrus Fruits*.—The title of this book scarcely describes the scope or importance of the work. The author has taken considerable trouble with the botany concerning the different cultivated forms of *Citrus* and has grouped the numerous varieties in well defined sections. Whilst his general remarks upon the family apply more particularly to cultivation in Florida and California, there is a considerable amount of information that will be found useful to growers in other countries. In the first chapter on the commercial importance of *Citrus* fruits, the author gives tables showing the total crop despatched by railroad transport over the period 1886–87 when Florida sent away 1,260,000 boxes

* The Cultivation of Citrus Fruits, by H. Harold Hume. Published by Macmillan & Co., Ltd., St. Martin's Street, London, and New York, as one of their Rural Science Series under the Editorship of Mr. L. H. Bailey. 1926. Pp. xxi + 561. Price 21s. net.

of fruit, and California 840,560 boxes, up to the period 1923–24, when Florida disposed of 20,399,614 boxes and California despatched 24,292,800 boxes of fruit. Tables are also given of the acreage of the various forms of *Citrus* cultivated in Florida and California in 1923. Three genera receive special attention in the book; *Poncirus*, represented by *P. trifoliata* Raf. better known in European gardens as *Aegle sepiaria* DC., or *Citrus trifoliata* L.; *Fortunella* the Kumquat, represented by three species; and *Citrus*, the most important genus which includes *C. Limonia* Osbeck, the Lemon; *C. aurantifolia* Swingle, the Lime; *C. maxima* Merrill, the Shaddock or Pummelo; *C. paradisi* Macf., the Pomelo or Grapefruit; *C. Aurantium* L., the Sour, Bigarade, or Seville Orange; *C. sinensis* Osbeck, the Sweet Orange; *C. nobilis* Lour., the King Orange; *C. nobilis* var. *deliciosa* Swingle, the Mandarin Orange or Tangerine Orange; *C. nobilis* var. *Unshiu* Swingle, the Satsuma Orange, *C. mitis* Blanco, the Calamondin; and *C. ichangensis* Swingle, from China. Following generic descriptions, chapters are devoted to each of the principal groups, thus in Chapter V, dealing with the Sweet Orange, fifty-one varieties are described under the sub-heads, Spanish Oranges, Mediterranean Oranges, Blood Oranges, and Navel Oranges. In a chapter on the Pomelos and Shaddocks, seventeen varieties of Grapefruit are described. Chapters are devoted to Breeding New Varieties, Propagation, Soils for Citrus Groves, Planting, Cultivation, Cover Crops, Fertilizers, Irrigation, Climate, Pruning, Gathering and Packing Fruit, Pests and other subjects. Illustrations, comprising 237 excellent drawings and photographs, form an important feature of the work; there is a good index, and the book is well produced with clear type.

W. D.

Florae Siamensis Enumeratio.*—The second part of this useful compilation, comprising the Bentham and Hooker families from *Linaceae* to *Anacardiaceae*, has now been published. It is expected that one more part will complete Vol. I. and accommodate the remaining families of the Polypetalae.

* A list of Plants known from Siam with Records of their occurrence, by W. G. Craib. Published for the Siam Society by the Bangkok Times Press. Luzac & Co., London, 1926, pp. 199–358. Part 2. Price 12s. 10d.

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ROYAL BOTANIC GARDENS, KEW.

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1925.

The Gardens.

The number of visitors to the Gardens in 1925 was 1,671,840. This was an increase of 135,985 over those recorded for the previous year.*

His Majesty King Feisul paid an official visit to the Gardens in the early summer.

Among other distinguished visitors may be mentioned H.R.H. Prince Chandhaburi and His Excellency The Siamese Minister ; the Lord Chamberlain, in connection with the proposal to display the collection of old prints and engravings relating to the history of the Royal Botanic Gardens and the Village of Kew, now in Museum No. III, in two of the rooms in Kew Palace.

New Plant Houses.—The most important structure erected in 1925 is a house for rhododendrons. This has been built on the western side of the Temperate House terrace in the recess between the large middle section and the Himalayan House. It backs on to the North Octagon, to the outside wall of which it has been ingeniously adapted by H.M. Office of Works. The wood-work is of teak and the roof, which consists of three ridges, is constructed to provide ample ventilation, the absence of which is a defect in the adjoining Himalayan House. Its dimensions are approximately as follows :—Length 60 ft. ; average width 40 ft.; greatest height 25 ft. Sufficient hot-water piping has been provided to keep out frost in all but the very severest weather. It will be entered from two doors abutting on the long central walk which traverses the whole length of the various sections of the main building, also by one opening on the terrace. The central area is occupied by a rectangular bed 42 ft. by 21 ft., surrounding which is a path 4 ft. wide. A border $5\frac{1}{2}$ ft. in width comes between the path and the walls. The purpose of this house is to provide accommodation for Chinese rhododendrons. The introduction of these shrubs, many of which are extremely beautiful and distinct, from the mountainous regions of the south-western provinces of China, has constituted perhaps the most important event in horticulture during the last decade. The name of Mr. J. C. Williams, of Caerhays, will always be remembered as the prime mover and main

* The charge of one penny for admission, which was removed in 1924, was reimposed as from 1st January, 1926.

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supporter of this enterprise, as will that of Mr. George Forrest as chief collector. But mention of the admirable work done by Capt. Kingdon Ward during recent years in the same connection must not be omitted, nor that of Mr. Reginald Farrer—although so unhappily cut short by his death in 1920.

Whilst these rhododendrons are proving themselves to be splendidly adapted to the gardens of Cornwall and places with a similar climate, it has become evident that many of the best of them, especially those with large leaves, are ill suited to the outdoor conditions at Kew, and that if they are to be represented at all satisfactorily here, protection will have to be afforded them. On the whole they are not so hardy as the species introduced by Mr. E. H. Wilson in the early years of this century from regions farther to the north, almost all of which bear the winter cold at Kew with impunity. Still the chief drawback in their cultivation is due to the late spring frosts so frequent at Kew, which not only cut back the young growths but destroy the flowers also.

A heated span-roof house, 50 ft. long, 9 ft. high, 18 ft. wide, has been erected in the Arboretum Nursery in place of an unheated "skeleton" structure there which could only be protected by a covering of canvas. This will be attached to the Temperate House department and used for growing on plants for the various sections of that House.

A "pit" 60 ft. long, 10 ft. wide, with a sunken central path has been built in the private frame yard of the Herbaceous Department to provide further accommodation for delicate and rare Alpine plants.

The collection of succulent plants has increased very considerably in recent years, and a frame 45 ft. long in the "Melon Yard," near the Curator's Office, has been built between houses No. 19 and No. 20 to give the additional space needed.

Owing to the injurious effects on the plants in the Orchid Houses occasioned by the continual opening of the doors by visitors, especially in cold windy weather, a wooden porch has been erected outside the sections 14 and 14A. This encloses the two entrance doors and thus mitigates very largely the effects of draughts from the outside air.

The following plant houses have been painted during the summer:—Cactus House, Stove, Begonia and Cape Houses, Orchid Houses, North end of the Palm House, and the two tropical Propagating Pits.

Objects of Special Interest.—During the year a part of the Cattleya House (No. 14C) adjoining the Orchid Houses, has been adapted and opened to the public for the exhibition of special displays and plants of particular interest. These exhibitions have been creating much popular interest during the last few years, and the houses in which they were accommodated had not sufficient passage way to permit visitors to linger over these exhibits without blocking the way to other parts of the houses. Considerable

disturbance of the collections also resulted when staging space had to be cleared for a special exhibit. Several exhibitions have been specially staged during the year, their meaning being explained by descriptive notices and labels accompanying the plants. The following subjects have been shown :—Phyllodes and phylloclades; examples of parallel development in plants belonging to unrelated Natural Families; the development of Winter Flowering Begonias, illustrated by examples of the wild species from which they originated, first hybrids and present-day varieties; the development of the Petunia was shown on similar lines; and plants of economic value have also been exhibited.

Greenhouse Ferns (No. 3 House).—In order that visitors may more conveniently inspect the ferns in this house and gain a better idea of their beauty and structure, the central stage, on which they were grown in pots, has been removed and the space it occupied has been enclosed by an informal arrangement of stones and the ferns planted out in prepared soil a little above ground level. Here they are thriving extremely well and afford one more example of how most plants prefer such treatment to having their roots confined in pots. The side stages, which were too high for all but tall people to see the plants properly, have been divided longitudinally into two sections, the front one of which has been lowered about nine inches. The whole aspect of the house has been much improved thereby.

Rose Garden.—The new arrangement of garden varieties of roses in the sunken area west of the Palm House which replaced the old beds of miscellaneous shrubs (see *K.B.* 1924, p. 29), has proved very popular with visitors. Although it is somewhat outside the main purposes of the establishment, there is probably no public garden in this country where garden lovers are able to inspect and enjoy so extensive a display of roses. The numerous enquiries received as to where the varieties can be obtained show that it is appreciated.

Rock Garden.—The gradual substitution of the various kinds of stone of which the Rock Garden was originally constructed in 1882 by one of a uniform type was interrupted on account of the war. During the past autumn the work has been resumed and a section at one side of the north end has been rebuilt, a mixed lot of stones having been replaced by weathered boulders from the Craven moors in Yorkshire. This stone is now very popular in rock gardening and in general appearance scarcely differs from material obtained from the Mendips—such as has been used in previous sectional renovations of the Rock Garden. One side of the Rock Garden is now finished and there only remains to be done a section built up of huge boulders of oolite from Gloucestershire, which has now a somewhat incongruous appearance.

Iris Garden.—It is now over thirty years since the collection of irises was planted on its present site (D.10). As is generally known, the popular sections of this genus need a change of soil at

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pretty frequent intervals to obtain the best results. The convenience of the present site, and its nearness to the rest of the herbaceous collections, made it undesirable to transfer the irises to an entirely new area, so the alternative of providing new soil on the existing one was adopted. This has occupied two seasons but is now completed. The leading authority on the genus, the late Mr. W. R. Dykes, whose tragic death has occasioned so great a loss to horticulture and botany, kindly helped with his advice in apportioning space for the various sections and in giving hints about their cultivation. We have also to thank Messrs. Wallace and Co., of Tunbridge Wells, and The Orpington Nurseries Co., for their kindness in presenting numerous plants of the best garden varieties, thereby bringing the collection to a more up-to-date condition.

Hardy Ferns.—About forty years ago Mr. Carbonell bequeathed his collection of British ferns to Kew but since then no considerable additions have been made to the collection. There is, however, a small but enthusiastic band of cultivators, united in the Pteridological Society, who have in the meantime been industriously raising and discovering new forms, most of which are lacking at Kew. Last autumn, three leading members of the Society, namely, Mr. Cranfield, Mr. Henwood and Dr. Stansfield, kindly offered to overhaul the collection, naming varieties whose identity has been lost, selecting plants which should be retained, and indicating those that might be rejected from the collection. A thorough knowledge of the numerous forms of these hardy ferns can only be acquired by those who are able to devote considerable time to their study, so Kew was glad to take advantage of the expert knowledge these gentlemen possess, especially as they made a generous offer also to contribute from their own collections such varieties as they could spare which were not represented here. They spent a considerable part of two November days at the work.

By removing a few large trees and some clumps of shrubs from the North Western portion of the Wild Garden surrounding the Temple of Æolus, sufficient space has been obtained to accommodate the greater part of the revised collection, a border ranging from 6 ft. to 20 ft. in width having been thoroughly trenched and the soil improved by the addition of peat moss and leaf soil. In order that fern-lovers may be able more closely to inspect the plants, the area is traversed by a winding path about 112 yards in length irregularly paved with York Stone.

Ivy Collection.—A collection of ivies is a difficult one to accommodate owing to the climbing space they need. When Mr. Shirley Hibberd's collection was acquired for Kew thirty to forty years ago, many of them were planted to grow over inverted tree stumps on the western side of the Sion Vista. For a good number of years they succeeded very well and many of them still exist there, but ultimately, owing to lack of opportunity to climb they assumed the flowering or "tree" form and thus lost their

chief attraction and much of their individuality. It is now proposed to devote the long east wall of the Herbaceous Ground, abutting on Kew Road, to ivies, replacing the common ivy with which it is at present clothed by the named collection. A beginning was made last spring.

Arboretum.—The provision of space for the growing collections of hardy trees and shrubs is a problem that intensifies year by year. The main lines of the present arrangement of Natural Families and Genera were schemed by Sir Joseph Hooker about 1870 when the developments of the XXth century, especially as regards Chinese introductions, could not have been foreseen. Since then the number of species and varieties in cultivation has more than doubled, and some sections are much too overcrowded. The maple collection for instance is one for which no further space in its present location is available. The collection of *Rosaceae* is another for which the need of additional room is imperative. In order to keep the members of this important Natural Family on one area, a piece of ground between the Holly Walk and the Service Road (L 6) has been cleared of a mixed lot of small trees. This will be occupied by the *Saxifragaceae*, the whole of which it is intended to plant west of the Holly Walk, where part of the Family is already established. This will enable us to allot the whole of the area south of the Temperate House that lies between the Holly Walk and the Pagoda Vista to the *Rosaceae*. Except for a few trees of *Prunus* too large to move, now growing in and near the "Canal" beds, the collection will be in a compact, well-defined space.

Cedar Vista.—The widening and re-turfing of this popular promenade, referred to in the *Review of Work during* 1924 (*K.B.* Appendix II, 1925, p. 38) has proved a great success. The Vista was kept closed during the early summer and this enabled the newly-laid turf to get thoroughly established. A sweep of closely mown turf now extends from the Lake to the Pagoda broad enough, it is hoped, to stand the increasing foot traffic in this part of the Gardens. We are not able, however, to feed our lawns now in the way that was possible before the advent of the motor omnibus. Twenty to thirty years ago the proprietors of the old horse-drawn vehicles were glad to deliver annually, at an almost nominal price, hundreds of loads of manure into the depôts. This, of course, came to an end long ago, and it is now difficult to get sufficient good manure for our ordinary cultures.

Decayed Trees.—A considerable amount of labour has been employed during the autumn in felling trees. Most of these were beeches which (as was feared at the time) never recovered from the effects of the drought of 1921. Several old elms also have had to be taken down, notably two very large trees near the Main Entrance, which had begun to drop limbs and consequently became dangerous owing to visitors taking shelter beneath them on showery summer evenings.

Tarring Paths.—The treatment of the walks with hot tar and pea gravel, commenced in 1923, was continued during the summer of 1925. Amongst others the long Broad Walk was done. Although all the more frequented walks have now been treated, it is intended to continue the work during the coming season. We find also that to get a really satisfactory result a walk has to be done twice, the second time, however, requiring much less material than the first. One result of this treatment of the paths we find to be that visitors do not walk on the grass verges so much. Consequently less repairing of these verges and less re-turfing generally was necessary last autumn.

The Flagstaff.—It becomes periodically necessary to treat the Douglas Spar with preservative and the work has been undertaken this year.

Old and defective preservative was carefully removed to the bare wood. Shakes in the timber were then faced with a plastex material, the tops of shakes being left open, in which hot solignum was poured. When saturation was completed the whole of the shakes were completely filled with the plastex material, and the Spar was twice coated with hot solignum, the work being commenced at the top.

The wire rope stays and all metal fittings were cleaned and treated with two coats of bitumastic paint, and all defective bindings of canvas, etc., were removed from shackles; the shackles were then well coated with grease, and rebound with new canvas.

Publications.—Eight sets of picture postcards of plants in natural colours have been placed on sale during the year, at the Publications Kiosk in the Gardens. Each set contains six cards with a descriptive folder of the subjects, and is priced at one shilling. Individual cards can be purchased at twopence each. The sets are devoted to Insectivorous and Stove Plants, Decorative Plants, Orchids, Stove and Greenhouse Plants, Rock Garden and Herbaceous Plants and Rhododendrons. The most popular card has proved to be a picture of the Bluebells in Queen's Cottage Grounds.

Three new sets, comprising twenty-one black-and-white cards, have also been placed on sale. This increases the total of subjects represented by plain photographs to eighty-four.

Five revised Hand-Lists have been published. They are Trees and Shrubs, Herbaceous Plants, Rock Garden Plants, Hardy Monocotyledons and Coniferae.

Additions to Gardens, 1925.—The number of separate consignments of living plants and seeds presented to the Gardens was 820. This represents an increase of 71 on that of 1924 and constitutes a further record in the history of the Establishment. A striking increase in the number of private donors is worthy of note. The most important donations were the following :—

Public Institutions :—

Aberdeen, Cruickshank Botanic Garden.—Plants of new Siamese introductions, including *Primula siamensis*, *Didymocarpus Wattiana* and *Chirita Marcanii*.

Amani Institute, Tanganyika Territory.—69 packets of seeds.
Arnold Arboretum.—Seeds, grafts and plants of hardy trees and shrubs.
Arboretum Vilmorinianum, Les Barres, France.—68 packets of seeds and hardy trees and shrubs.
Brno Botanic Garden, Czecho-Slovakia.—58 packets of seeds.
Buitenzorg, Botanic Garden.—Seeds of palms and economic plants.
Cambridge, Botanic Garden.—Seeds, plants and cuttings.
Chelsea Physic Garden.—A Collection of Liverworts, seeds and plants, including *Encephalartos Hildebrandtii*.
Darjeeling, Lloyd Botanic Garden.—235 packets of seeds.
Dehra Dun, Forest Research Institute.—Collections of seeds of economic plants.
Dunedin, Botanic Garden.—130 packets of seeds, including many varieties of *Phormium tenax*.
Edinburgh, Royal Botanic Garden.—162 packets of seeds; plants of *Ibervillea Lindheimeri*, *Calceolaria spp.*, etc.
Floriana Botanic Garden, Malta.—58 packets of seeds.
Geneva, Botanic Garden.—82 packets of seeds.
Glasgow, Botanic Garden.—Seeds and plants, including *Bomarea Carderi* and *Begonia Moorei*.
Glasnevin, Botanic Garden.—52 packets of seeds; plants of *Drosera pygmaea*, *Schomburgkia Wallisii* and *Calceolaria spp.*
Gothenburg, Botanic Garden.—Collection of *Sedum spp.*, including *S. Stribrnyi*.
Grahamstown, Botanic Garden, S. Africa.—Seed of *Araucaria Bidwillii*.
Hongkong, Botanic Garden.—Seeds, including *Tutcheria spectabilis*.
Hyde Park.—Collections of bedding and decorative plants.
Honolulu, Forestry Department.—Seed of *Argyroxiphium sandwicense* var. *macrocephalum*.
John Innes Horticultural Institute, Merton.—Plants of *Calceolaria spp.*
Kirstenbosch Botanic Garden, South Africa.—Seeds and plants of Cape *Pelargonium spp.*, and *Erica spp.*
Leiden, Botanic Garden.—52 packets of seeds.
Leningrad, Botanic Garden.—96 packets of seeds.
Lisbon, Botanic Garden.—46 packets of seeds; plants of *Eichhornia crassipes*, and *Marsilea aegyptiaca* var. *lusitanica*.
Melbourne, Botanic Garden.—30 packets of seeds and corms of hybrid Watsonias.
Montevideo, Botanic Garden.—78 packets of seeds, including *Verbena bonariensis*.
Montpellier, Botanic Garden.—57 packets of seeds.
Orotava, Botanic Garden, Teneriffe.—A collection of 22 varieties and species of *Musa*.
Ottawa, Central Experimental Farm.—64 packets of seeds.
Penang, Botanic Gardens.—A collection of fern spores collected at Kedah Peak.

Pruhonice, Prag, Dendrological Society.—Collection of hardy trees and shrubs.

St. Louis, Botanic Garden, Missouri.—Collection of Panama Orchids, *Nymphaea spp.*, and plants of *Dionaea muscipula*.

Sierra Leone, Dept. Lands and Forests.—Stem cuttings of Sugar-cane; corms of *Gladiolus spp.*, etc.

Singapore, Botanic Garden.—Collection of ferns, orchids and stove plants.

Tiflis, Botanic Garden.—60 packets of seeds.

Tokyo, Botanic Garden.—Seeds of *Taiwania cryptomerioides*, etc.

Trinidad, Dept. of Agriculture.—Plants of *Bougainvillaea sp.* from Ecuador, seeds and fern spores.

U.S. Dept. of Agriculture, Washington.—Economic plants including *Lecythis zabucajo*; plants of *Sarracenia spp.*, etc.

Zurich, Botanic Garden.—Seeds and plants including *Sempervivum Moggridgei* and *Mesembryanthemum Püttkamerianum*.

Private Donors:—

Mr. B. C. Aston, Wellington, New Zealand.—Seeds of New Zealand plants.

Mr. S. C. Atchley, Athens, Greece.—Seeds, bulbs and corms collected in Greece and Crete.

Messrs. Barr and Sons, Covent Garden.—Seeds of *Celmisia spp.*, *Primula Menziesiana*, etc.

Messrs. Bees, Ltd., Liverpool.—Plants of *Primula chrysopa*.

Rev. A. T. Boscawen, Cornwall.—Plants and seeds; also seeds of *Telopia speciosissima*, from plants grown at Ludgvan Rectory, Long Rock, R.S.O., Cornwall, 1925.

Messrs. Bowell and Skarratt, Cheltenham.—Hardy Orchids, including *Orchis Brancifortii* and *Habenaria chlorantha*.

Mr. N. E. Brown, Kew.—Plants of *Mesembryanthemum spp.*, and Cape succulents.

Mr. A. K. Bulley, Ness, Neston.—Seeds and plants of Alpines.

Mr. A. C. Burrage, President, Massachusetts Horticultural Society, U.S.A.—A large collection of hardy North American *Cypripedium spp.*, plants of *Osmunda regalis* and *O. cinnamomea*.

Mr. G. R. Cameron, Punta Arenas, Chile.—Seed of *Lathyrus magellanicus*.

Col. Stephenson Clarke, Borde Hill, Cuckfield.—A collection of dwarf conifers.

Sir Jeremiah Colman, Gatton Park, Surrey.—Plants of *Dendrobium cariniferum* and *Coelogyne sp.*

Mr. A. T. Cussons, Manchester.—Plants of *Cypripedium sublaeve* and *C. venustum*.

Mr. L. A. Dode, Paris.—Cuttings of trees and shrubs including *Populus Hickeliana*.

Major A. A. Dorrien Smith, Tresco Abbey.—Plants and seeds, including *Pittosporum obcordatum*.

Mr. E. J. Dunn, Kew, Victoria, Australia.—Seed of *Pentzia sp.*, and *Acacia Dunnii*.

Lt.-Col. F. R. Durham, Kew.—Seeds and plants collected in the Canary Islands and South-West Africa.

The late Mr. W. R. Dykes, Guildford.—Plants of *Iris nepalensis*, and a collection of *Tulipa spp.*

Mr. F. Frith, South African Railways Ltd. (Wembley Exhibition).—A large collection of Cape succulents, including *Euphorbia Dregei*, *Frithia pulchella*, *Mesembryanthemum Lesliei*, and *M. Bolusii*.

Hon. Vicary Gibbs, Aldenham House, Elstree.—Trees and shrubs.

Dr. Gravely, Egmore, Madras.—Collection of succulents, including *Caralluma spp.*

Prof. H. G. Greenish, Pharmaceutical Society, London.—Bulbs of *Urginea indica*, etc.

Commendatore C. Hanbury, La Mortola, Ventimiglia, Italy.—134 packets of seeds.

Marquis of Headfort, Kells, Co. Meath.—Plants of Forrest's dwarf *Rhododendron spp.*

Dr. A. Henry, College of Science, Dublin.—Seeds of trees and shrubs.

Mr. T. E. Henwood, Reading.—Hardy ferns.

Messrs. Hillier and Sons, Winchester.—Hardy trees and shrubs.

Sir G. Holford, Westonbirt, Tetbury.—Orchids, including *Masdevallia Arminii*, *Epidendrum Burtonii*, etc.

Mr. E. M. Holmes, Ruthven, Sevenoaks.—Plants and seeds, including "*Rose verte*" and *Mentha piperita*.

Ven. Archdeacon A. Hombersley, Trinidad.—Seeds of *Hibiscus spp.* and fern spores.

Capt. C. Ingram, Benenden, Kent.—Seeds, plants and grafts of *Prunus spp.*

Mr. G. H. Johnston, Grampound Road, Cornwall.—Plants of *Ilex corallina* and *Rhododendron Albrechtii*.

Mrs. J. C. Rooke Johnston, Bagamoyo, Tanganyika Territory.—Seeds of *Nymphaea spp.*

Mrs. W. Jones, Aberuchill Castle, Comrie, Perth.—Plants of *Meconopsis grandis*, *M. paniculata*, *M. quintuplinervia* and other alpines.

Dr. A. F. G. Kerr, Bangkok, Siam.—Tubers of *Amorphophallus spp.*

Mr. C. C. Lacaita, Selham House, Petworth.—Seedlings of *Melitella pusilla* from Malta and Gozo.

Mr. C. H. Lankester, Costa Rica.—Collection of orchids, fern spores, etc.

Sir W. Lawrence, Dorking.—Collection of hardy and half-hardy bulbous plants.

Mr. G. W. E. Loder, Ardingly.—Trees and shrubs.

Mr. J. A. MacPherson, Granity, West Coast, N.Z.—95 packets of seeds.

Messrs. Mauger and Sons, Guernsey.—*Lachenalia spp.*

Dr. E. D. Merrill, California.—Plants of *Darlingtonia californica*.

Mr. H. Musk, Wye, Kent.—Hardy British Orchids and *Daphne Laureola*.

The Orpington Nurseries Ltd., Kent.—A large collection of garden varieties of *Iris*.

Major A. Pam.—South American Orchids and bulbs.

Mr. E. E. Pescott, Melbourne.—Australian seeds, including *Hardenbergia Comptoniana*.

Mr. N. S. Pillans, Rosebank, C.P., South Africa.—Seeds and plants of *Erica spp.*, and succulents.

Dr. R. L. Praeger, Dublin.—*Sempervivum spp.*

Sir J. Ramsden, Gerrard's Cross.—Plants, bulbs and corms, including *Gladiolus Mackinderi* and *Plectranthus chiradzulensis*.

Mr. H. N. Ridley, Kew.—Plants of *Orchis laxiflora*, collected in the Channel Islands.

Dr. F. A. Rodway, Nowra, N.S. Wales.—Seeds of Australian native plants.

Mr. Lionel de Rothschild, London.—391 packets of seeds collected by Capt. Kingdon Ward.

The Hon. Mrs. Ryder, Brockenhurst.—*Watsonia* and *Nerine spp.*

Messrs. Sanders, St. Albans.—Orchids including *Vanda pumila*.

Mr. N. B. Sansom, Banff, Alberta, Canada.—Collection of Canadian native plants.

Mr. H. C. Shekell, Jamaica.—Collection of Tree Ferns.

Mr. F. L. Skinner, Dropmore, Manitoba, Canada.—Seeds and plants, including *Houstonia longifolia* and *Lithospermum canescens*.

Mr. F. W. Smith, Cannes, France.—Collection of hardy orchids.

Dr. W. H. Stansfield, Reading.—Hardy ferns and alpines.

Mr. E. Taylor, Southborough.—Seeds, plants and cuttings of *Mesembryanthemum spp.*, and other succulents.

Dr. R. B. Thomson, Toronto University, Canada.—*Sarracenia spp.*, from the Holland River.

Mr. G. C. Turner, Kingston.—Large plants of *Agave spp.*

Mr. C. B. Ussher, Sierra Madre, California.—Seeds, plants and cuttings of Californian plants.

Messrs. R. Veitch and Sons, Exeter.—Plants of *Calceolaria Veitchii*.

Mr. A. B. Voules, London.—Collection of *Vanda spp.*, *Renanthera spp.*, and plants of *Trichoglottis fasciata*.

Sir O. E. Warburg, Epsom.—Plants and seeds, including *Arbutus spp.*, and *Drosophyllum lusitanicum*.

Mr. James C. Watt, Aberdeen.—Seeds of Rhododendrons, collected in Northern India.

Dr. A. H. Williams, Horsham.—Seeds of New Zealand plants.

Mr. A. M. Williams, M.P., Launceston, Cornwall.—Plants, including a fine plant of *Rhododendron lacteum*, *R. cyclium*, and *R. tephropeplum*.

Mr. J. C. Williams, Caerhays Castle.—326 packets of seeds collected by Mr. G. Forrest.

Mr. P. D. Williams, St. Keverne.—Trees and shrubs.

Miss M. Wilman, Kimberley.—Seeds and plants of Cape succulents.

Miss E. Wilmott, Warley, Essex.—Collection of seedling *Pelargonium spp.*

Mr. A. Worsley, Isleworth.—Collection of plants including Cacti, *Crinum Elwesii*, and *C. Moorei*.

Mr. K. Yashiroda, Fuchisakimura, Japan.—Japanese seeds, including *Pyrus ussuriensis* and *Prunus Davidiana*.

Distributions of Plants and Seeds.—The usual distribution of surplus plants from the various collections was made, either in exchange with botanic gardens, nurserymen, etc., or as gifts to educational institutions. The total number of packets of seeds distributed was :—hardy trees and shrubs, 2619, hardy herbaceous plants, 4608. The most important seeds specially distributed were *Astrebla pectinata*, *Pinus Armandii*, *Leschenaultia biloba*, *Dendrocalamus sikkimensis* and *Pinus monophylla*.

Wardian cases of plants were despatched to the Botanic Gardens of Singapore and Peradeniya, Ceylon. Other Wardian cases were sent to the Departments of Agriculture at Brisbane; Salisbury, Rhodesia; Accra, Gold Coast; Seychelles; Bathurst, Gambia; and to the Amani Institute, Tanganyika Territory.

The recipients of plants, etc. from Kew included the following:—

Arnold Arboretum.—Plants and seeds of hardy trees and shrubs.

Cambridge, Botanic Garden.—Greenhouse and tropical plants and seeds.

Dublin, Trinity College.—Plants of *Mesembryanthemum Bolusii*.

Edinburgh, Royal Botanic Garden.—Plants and seeds, including *Hibiscus Waimeae* and *Nepenthes Thorellii*.

Glasgow, Botanic Garden.—*Nepenthes spp.*

Glasnevin, Botanic Garden, Dublin.—Plants, seeds and cuttings, including *Ilex paraguayensis*.

Harvard University Botanic Gardens, Cambridge, Mass., U.S.A.—Seeds of *Alstroemeria spp.*, and *Victoria regia*.

Trinidad, Dept. of Agriculture.—Plants of *Derris elliptica*.

U.S. Department of Agriculture, Washington.—Plants, seeds, grafts and cuttings, including *Prunus Zabeliana*, *Aesculus chinensis*, *Berberis spp.*, and *Tilia intonsa*.

Zurich, Botanic Garden, Switzerland.—Plants of *Nepenthes spp.*, including *N. Rafflesiana* var. *Hookeriana*.

Mr. F. R. S. Balfour, Dawyck.—Hardy trees and shrubs, including *Nothofagus Dombeyi*.

Mr. B. J. Beckton, Manchester.—A collection of orchids, including *Sobralia Lowii* and *Disa luna*.

Mr. C. A. Benn, Leominster.—Cuttings of *Populus spp.*

Rev. A. T. Boscawen, Cornwall.—Trees and shrubs, including *Myrtus Ralphii*, and *Nothofagus Dombeyi*.

Col. Stephenson Clarke, Cuckfield, Sussex.—Trees and shrubs, including *Styrax Veitchiorum* and *Carpinus Turczaninovii*.

Madame Daigremont, Soisy-sous-Montmorency, France — A collection of *Sedum spp.*

Hon. Vicary Gibbs, Aldenham House, Elstree.—Trees and shrubs.

Dr. J. Goffart, Agla, Tangier.—Seeds of *Acacia spp.*

The Marquis of Headfort, Kells, Co. Meath.—Trees and shrubs.

Capt. C. Ingram, Benenden, Kent.—*Prunus spp.*, and *Rhododendron hippophaeoides*.

Lord Lambourne, Romford.—*Nymphaea spp.*

Sir W. Lawrence, Dorking.—Stove and greenhouse plants, including *Begonia Pearcei*.

Mr. G. W. E. Loder, Ardingly.—Trees and shrubs, including *Rhododendron burmanicum*.

Sir F. W. Moore, Rathfarnham, Co. Dublin.—A collection of hardy trees, shrubs and alpines, including *Camellia theifera*, *Salix Bockii* and *Primula Heeri*.

Mrs. Hope Nelson, Lake Como, Italy.—Collection of seedling *Rhododendron spp.*, including *R. fictolacteum* and *R. fulvoides*.

Lt.-Col. E. R. Pratt, Downham, Norfolk.—Cuttings of *Populus spp.*

Hon. Mrs. Ryder, Brockenhurst.—Seeds and bulbs of *Lilium spp.*

Major F. Stern, Goring-by-Sea, Sussex.—Hardy trees and shrubs.

Sir O. E. Warburg, Epsom.—Hardy trees and shrubs.

Mr. E. H. Wilding, Stoke Poges.—Plants of *Enkianthus spp.* and *Arctostaphylos Manzanita*.

National Pinetum at Bedgebury.—Notes on the inception and progress of this new enterprise have already appeared in the *Kew Bulletin* for 1924, p. 113, and in that for 1925, p. 293. In the latter note it is recorded that 315 species and varieties of *Abies*, *Tsuga*, *Pseudotsuga* and *Larix* were planted at Bedgebury in March, 1925. It is satisfactory to be able to record that nearly all these have succeeded well, especially as they had to encounter a dry period in May and June. A man was sent from Kew to give them some attention in the matter of watering and mulching at that time, and this, no doubt, helped them to tide over a critical period. At any rate very few have failed, these being chiefly plants too large or too badly rooted to transplant with safety.

It was hoped that in the present *Review* we should have been able to record the practically complete planting of the whole area. Arrangements had been made at Kew to have about 1,700 young trees delivered and planted in October. Unfortunately our partners in the undertaking, the Forestry Commission, were unable to fulfil their part of the work and get the ground ready for us by that time. This was owing chiefly to difficulties experienced in getting the merchants to whom the timber growing on the site had been sold to clear it away. It is, however, confidently anticipated that, given favourable weather, the present season's planting will be finished in March. This will complete the planting of the main bulk of the pinetum. The addition of new, rare or missing species will, of course, have to continue indefinitely as occasion offers.

In early June last, at the invitation of the Director, a party of distinguished amateurs interested in the Coniferae, together with representatives from the Ministry of Agriculture, the Forestry Commission and Kew, visited and inspected the site. The opinion was unanimously expressed that it would be difficult to find a better one. It is, indeed, a matter for congratulation that we have been able to secure an area so suitable in regard to soil and climate, so adequate in point of size, and possessing such natural beauty.

RAINFALL RECORDED AT THE ROYAL BOTANIC GARDENS, KEW, DURING 1925.

	Inches.		Inches.
January	1·60	July	3·40
February	3·33	August	2·44
March	·46	September	2·31
April	1·74	October	2·98
May	2·14	November	1·45
June	·04	December	2·62

Total 24·51 inches.

The Museums.

During the past year numerous enquiries bearing upon Economic Botany have been dealt with, and a varied assortment of products received for determination and report. In this connection, where critical microscopical examination has been found to be necessary, much valuable assistance has been rendered by the Assistant Keeper of the Joddrell Laboratory. Although the material received is often of a scrappy nature, it is gratifying to be able to report that it is rather the exception than the rule to meet with a negative result. These enquiries range from the determination of often unfamiliar timbers, barks, dyes, tans, drugs, fruits, seeds, etc., to the examination of various products, as cattle and poultry foods suspected of containing dangerous ingredients. In addition to the correspondence handled many personal enquiries have been made at the Museums by representatives of commercial firms, students and planters seeking information and suggestions as to suitable economic plants for experimental cultivation in many of our Colonies and possessions.

The duties in connection with securing and the subsequent removal of the various collections made over to the Museums from the Wembley Exhibition, followed by the preparation of the material for incorporation in the permanent collections, has rather disorganised other Museum duties; however, the bulk of the material received has now been checked, labelled and placed in position. It is to be regretted that the Timber Museum is so crowded with specimens that it is impossible to display them adequately, and it is greatly to be hoped that at no distant date it will be found possible to extend the building so that the many new timbers appearing in commerce and the material received from Wembley may be exhibited to the best advantage.

Duplicate products have been distributed to the Botany Department, Marischal College, Aberdeen ; The Education Department, Wimbledon ; The University, Riga, Latvia ; University of British Columbia, Vancouver ; The Government Research Institute, Taihoku, Formosa, etc.

During the year special exhibits were made of Ramie (*Boehmeria nivea*, var.) and Portraits of early Botanists with plants commemorating their names, and a series of photographs of *Cupressus macrocarpa* taken under natural conditions. The Ramie exhibit included stems grown at Kew, cleaned fibre, fibre in various stages of manufacture and a wide range of textiles manufactured from the fibre. The textiles included dress fabrics, damasks, plushes and lace. The portraits of botanists and plants exhibit was brought together more particularly for the information of students visiting Kew for a course of botanical instruction during the month of August. The *Cupressus* exhibit illustrated the gnarled condition of the tree in its restricted natural habitat.

Presentations to Museums.—The following are the chief donations to the Museums since those previously recorded in the *Bulletin* :—

Superintendent, Royal Naval Cordite Factory, Holton Heath.—Four photographs of Cotton fibres. Also samples of Ramie fibre prepared from stems grown at Kew.

Superintendent, Forest Products Laboratories of Canada, Montreal.—A collection of hand specimens of Canadian Woods.

Director of Agriculture, Seychelles.—Samples of plaiting used locally in the manufacture of hats.

Messrs. Westbury and Son, Ltd., Borough, S.E. 1.—Carved Bamboo stem and a specimen Whangee Cane from Japan.

Mrs. W. Goldring, Cheam, Surrey.—Ornamental clock with pedestal of carved Indian Timbers, presented to the late Mr. William Goldring by his Highness the Gaekwar of Baroda, during January, 1893.

Messrs. Kepston, Ltd., Berkhamsted.—Hand specimens of wood of Celery-topped Pine and Australian Myrtle, also model of Kepston Ironing-board.

Mr. C. Coltman-Rogers, Bucknell, Salop.—Cones of *Abies Forrestii*.

Sir Stewart Stockman, Veterinary Laboratory, New Haw, Weybridge.—Samples of Seeds of *Lathyrus sativus* and *Lychnis Githago*.

Mr. S. Maugham, Southampton.—Photograph of a fasciated stem of *Ranunculus sceleratus*.

Mr. G. B. Hinton, Mexico.—Twenty-one photographs of Mexican Pines.

Mr. G. M. Ryan, Notting Hill.—Specimens of water-yielding plant *Calycopteris floribunda*, received from Bombay.

Director of Forests, Ibadan, Nigeria.—Wood and pods of Ambatch Tree (*Herminiera Elaphroxylon*) from Lake Chad.

The Rt. Hon. the Earl of Powis, Powis Castle, Welshpool.—Planks of *Abies pectinata* and *Pinus Jeffreyi*.

Miss L. Frere, Westbourne Terrace, Hyde Park.—Framed water-colour drawing of a Date Palm in blossom.

Mr. E. Braunton, California.—Eight photographs of *Cupressus macrocarpa*.

The late Mr. J. S. Gamble.—A collection of hand specimens of Indian timbers.

Mr. A. Wigglesworth, Trinity Square, London, E.C.—Sample of Sisal Hemp prepared by the Amboni Estates, Ltd., on the East Coast of Africa.

Agricultural Department, Gold Coast, per Mr. F. N. Howes.—Two fuel brickettes manufactured from the pericarp fibre and shells of the African Oil Palm.

Mr. A. Bruce Jackson, The Avenue, Kew Gardens.—Enlarged photograph of a Sweet Chestnut tree at Deepdene, Dorking.

Additions to the Museums from the British Empire Exhibition, Wembley, 1924 and 1925.

India.—A valuable addition to the collections is the fine model of an Indian Lac Factory from the Bihar and Orissa Court, presented by the Indian Lac Association for Research. This model is placed near the entrance door of Museum I. A case of various forms of Lac presented by Messrs. Mahaderprasad Kashiprasad, of Calcutta, will be incorporated in the Lac Collection in Museum I.

Malaya.—Of special importance among the products secured from this section is a comprehensive set of Timber specimens together with photographs and drawings of the trees, also drawings and dried plants of Rotans (*Calamus* spp.), Guttas, Jelutong, a series of Dammars and many other miscellaneous products.

Sarawak.—A mounted series of photographs, illustrative of the Sago Industry, placed in Museum II., also samples of Jelutong Cutch and a Dyak Hunter's Outfit.

Cyprus.—A small collection of Indigenous timbers.

Palestine.—Various products including a series of Dyes, Tans and Agricultural produce together with a mounted exhibit illustrating silkworms fed upon leaves of the Castor Oil Plant.

Zanzibar.—Samples of Cloves, Nutmegs, Pepper (*Piper nigrum*), Cola Nuts, Chillies, Copra also Matting and Rope of Coconut Fibre, Turmeric, Mangrove Bark, Cassava, etc.

Tanganyika Territory.—Included in an interesting collection of products received from this Court the following may be noted :—Sisal Hemp cordage and matting, and samples of various other fibres, Seeds and Oil of *Telfairia pedata*, Cinnamon bark, Camphor crystals, Areca fruits and nuts, Cinchona barks, Rubber Samples and other valuable products from the Amani Institute.

Uganda.—A valuable series of Fibres, Samples of Coffee, Tea, Oil-seeds, Kapok, Soya Beans, Photographs of economic plants, etc.

Kenya.—Specimens of Indigenous Fibres, Wattle bark, Sugar Cane and Sugars, Cotton, Flax, Coffee, Tobacco, Kapok, Spanish

Chestnuts and Acorns of *Quercus sessiliflora* grown in the Nakuru District.

Sudan.—A collection of Gum Arabic, Fruits and Seeds of the Doum Palm (*Hyphaene Thebaica*) and buttons made from the Kernels, Cotton, Plank of Mahogany (*Khaya senegalensis*), Log of Ambatch (*Herminiera Elaphroxylon*), Hand specimens of Woods, Oil of Heglig (*Balanites aegyptiaca*), etc.

Sierra Leone.—From this Court a considerable amount of material was obtained, including Timbers, Copals, Oil-seeds and Oils, Dyes, Tans, etc. Also a native dugout River Canoe, which has been placed upon the Lake by the Palm House, and a small Kroo Canoe, which is exhibited in Museum III.

Gold Coast.—Amongst other general produce obtained from this section the following may be noted:—Fibres, Oil-seeds and Oils, Rubbers, Cinnamon, Cocoa, Kola nuts and a Helmet made of Ambatch Wood (*Herminiera Elaphroxylon*).

Nigeria.—Samples of Fibres, Dyes, including *Indigofera arrecta*, Rubbers, Pulses, Ground Nuts, Cotton and a log of Mangrove Wood (*Rhizophora racemosa*).

Union of South Africa.—A large and valuable collection of photographs of S. African vegetation and samples of Timber from Swaziland.

Canada.—Many sections of Timber including a fine log and planks of Douglas Fir, Western Red Cedar, etc. Manufactured articles of Wood and a series of specimens illustrating the wood-pulp industry.

Jamaica.—Sections of Timber, Trunks of Logwood and Fustic, Section of stem of a Camphor Tree and many other products, also a large collection of Photographs of economic plants.

Trinidad.—The products obtained from this Court include samples of Para Rubber, Cocoa, Coconuts, Copra, Coir fibre, rope, etc.

St. Lucia.—Various miscellaneous products including sections of timber of *Cedrela odorata*, *Pimenta acris* and *Mimusops globosa*, also various pulses, Nutmegs, Kola seeds, Cinnamon, etc.

British Honduras.—Samples of indigenous timbers.

British Guiana.—A large and miscellaneous collection of products of which the following may be noted:—Balata Soleing and Machine Belting, several utensils made of Balata, also Belt and Rope for climbing Balata trees, Samples of Rubber, Fruits, Food materials, models of a Keg and Vat, Paling Staves and Roofing Shingles of Wallaba Wood (*Eperua falcata*).

New Zealand.—Specimens of Fibre Cord and Binder Twine of New Zealand Hemp (*Phormium tenax*) and a few planks of Native timbers including Kauri Pine (*Agathis australis*), Totara (*Podocarpus Totara*), Rimu (*Dacrydium cupressinum*), etc.

In addition to the foregoing many examples of Timber and manufactured articles were generously donated to the Museums by various firms and private exhibitors in the British Forestry Section.

The Jodrell Laboratory.

Numerous specimens of wood and other plant products were examined microscopically, and identified as far as possible by the anatomical method. These were, in most cases, samples representing products of economic interest; a series of ancient Egyptian specimens of wood was also examined. The Assistant Keeper was chiefly engaged in work of this kind, but also paid some attention to cases of foliage injured by smoke, and made further experiments on the germination of spores.

Mr. R. N. Chrystal continued his researches on the species of *Chermesidae* parasitic on the Silver Fir. These dealt with the effects produced on the tissues of the host-tree as a result of attack, and interesting comparisons were made of the different effects produced on various species of Silver Fir (Phil. Trans. R.S. Lond. series B: 214, p. 29). Further studies were also made upon the nature of the cell-contents in abnormal tissues, produced as a result of attack.

Mr. G. H. Jones carried out an experiment with young Cotton plants, with the object of finding out whether any pathological effect would be caused by excessively heavy watering.

Miss M. E. Odell examined the epidermis of the leaves of a number of living plants for purposes of comparison with the epidermis of leaves of fossil plants found in a Pipe Clay belonging to the Lower Bagshot series.

Five students from the Imperial Forestry Institute, Oxford, under Mr. H. G. Champion, were accommodated in the Laboratory for a short time in July.

By arrangement with the Board of Education a course of instruction for Teachers in Secondary Schools, similar to that held in 1923, was given from August 6th — 14th. The course was again organised by Dr. Harold Wager, F.R.S., and was attended by forty teachers; it included lectures and practical botanical work, for which accommodation was provided in the Lecture Rooms adjoining the Jodrell Laboratory, demonstrations in the Gardens and Museums, and visits to the Herbarium and Library.

Herbarium.

A special effort was made in 1925 to render available for workers further accumulations of unclassified material, especially those housed in the Stores. Sanction for the special temporary staff for this purpose granted in 1924 was renewed in 1925 and very substantial progress has been made. Owing to the lack of cabinet space on the one hand and lack of time for naming on the other, large temporary and preliminary sortings have had to be arranged both in the Herbarium and in the Stores, but inasmuch as the material thus sorted is available for consultation, such sortings have proved useful and have been appreciated especially by visitors. Further relief was also afforded in 1925 by the appointment of additional regular staff, namely, a permanent scientific assistant for the Index Kewensis, a clerk for bookkeeping and a typist. The post of Assistant Librarian hitherto held by a temporary technical

assistant was moreover made permanent. The extra clerical assistance provided enabled the scientific staff to devote more time to botanical work.

In order to meet the demand for extra cabinet space a scheme was evolved whereby additional floor accommodation could be secured apart from the building of a new wing. This was accomplished by uniting the hitherto separate cabinets into a single carcase, thus allowing the insertion of two pairs of additional cabinets in each block, i.e., 64 shelves. To permit of this all the old cabinets have to be emptied and their doors are being rehung with "butterfly" hinges. Further shelving may be added later as an upper storey to each block of cabinets. The work was put in hand in November and the completion of the whole will take upwards of three years.

In order to carry out the above alterations it was first necessary to rearrange the entire heating apparatus. The cumbersome four-inch pipes were replaced by a more modern method, namely the "drop system" in which small radiators placed below the windows are connected by vertical pipes, thus allowing the cabinets to be placed right up to the wall. Radiators have also been installed in the Herbarium Storehouse which during the past winter was temporarily heated by gas fires. The re-decoration of both wings of the Herbarium, last carried out in 1904, was commenced and is to be completed early in 1926.

These extensive structural alterations have caused considerable inconvenience to the Herbarium staff and their work has often been carried out under difficulty.

EUROPE.—*Routine*.—Considerable time has been spent in the incorporation of new material and in the re-arrangement of that already existing in the Herbarium. With regard to the latter, special attention has been paid to the writing up, according to monographs, of important genera. The most noteworthy of these was *Hieracium*, which has been arranged according to Zahn's monograph. Approximately 4,000 additional sheets of this genus were extracted from the Stores, mainly from the Churchill and Willmott collections. These have been written up and incorporated so that the genus *Hieracium* is now represented by a very fine series of properly arranged specimens. Similar work has been carried out with *Taraxacum* using Handel-Mazzetti's monograph. Amongst other genera which have been re-arranged mention may be made of *Geum*, *Verbascum*, *Veronica*, *Thesium*, and the whole of the European *Labiatae* with the exception of *Thymus* and *Ajuga*. The arrangement of *Centaurea* and *Linaria* has also been commenced.

The entire collection consisting of 778 specimens from Bosnia and Herzegovina made and presented by Dr. K. Maly has been mounted and laid in, and also about 10,000 sheets from the Store. Several thousand others have also been mounted, but these, owing to the shortage of cabinets, have only been temporarily sorted.

Opportunity was taken of the re-arrangement of cabinets to lay in the collection of Conifers received from the late Dr. Maxwell

Masters, which had hitherto been kept separate in its own cabinet. The collection (which naturally included extra-European material), contained many interesting specimens as well as notes on plants referred to in published papers by Dr. Masters.

The Rev. E. Ellman kindly invited one of the Temporary Assistants to accompany him on a month's collecting expedition to the Pyrenees, and, as a result of this, some 290 interesting or critical Pyrenean plants have been added to the Herbarium.

Research and Publications.—Two papers dealing with the European flora were published during the year, namely, "Notes on the Flora of the Balkan Peninsula" (*K.B.*, 1925, p. 34), and on "The Flora of the Varna District, East Bulgaria" (Journal of Botany, Vol. 43, p. 157).

Asia.—*Routine.*—A very large amount of material has passed through the hands of the Assistant for India. Plants received from the Imperial Forest Botanist at Dehra Dun and the Forest Botanist, Burma, together with a large collection from the Palni Hills, received from the Rev. A. Saulière and the Rev. L. Anglade have been named, mounted and laid in. The whole of the Duthie Herbarium has been mounted and a further instalment has been incorporated. Owing to the frequent handling of the Wallich Herbarium a very large number of specimens had become partially detached. With the aid of a grant from the India Office it has been possible to put an experienced mounter on the work of restoring the sheets, and about a third of this work has now been completed. Of the donations received mention must be made of the magnificent herbarium of the late Mr. J. S. Gamble (*see K. B.*, 1926, p. 12). This will be incorporated, in accordance with Mr. Gamble's express wish, as soon as possible, but, owing to the congested state of the Herbarium, no attempt was made to do so during the past year. With the additional cabinet space available a commencement was made with the *Gramineae* in the Gamble Herbarium on January 1st, 1926. The whole of this herbarium therefore has been stored in Mr. Gamble's own boxes in the cellar and, being fully labelled, is available for consultation.

In the Chinese Section the principal work during the year has been the re-arrangement of genera and the naming of collections. The major portion of Père E. Licent's collection from Northern China, including some 2,700 plants, has been identified and the names have been sent to him to The Hoang Ho Pai Ho Museum, Tientsin. The herbaceous *Leguminosae*, collected by J. F. Rock in South West China and on the Tibetan border, have been determined and the list forwarded to the U.S. National Museum. The valuable collection made by Capt. F. Kingdon Ward in South-West Tibet during 1924 and presented during 1925 has been largely worked out. It has been found to contain a large number of novelties and the diagnoses of many of these have been drawn up. A further consignment of Forrest's plants, 1921–22, consisting of close on 2,000 sheets, was received from the Royal Botanic Garden,

Edinburgh. These have been laid out and mounted and about 1,600 have been labelled by cutting up a copy of the catalogue of Forrest's plants published in the Notes of the Royal Botanic Garden, Edinburgh. Owing to the large amount of laying in accomplished last year most of the available cabinet space for Chinese material has been filled. Much of the named material when mounted is therefore temporarily sorted into families.

Further collections received from Siam, from Dr. A. F. G. Kerr, have been identified by Prof. W. G. Craib and some 300 Siamese grasses have been named at Kew. As far as possible all Siamese material is laid in, and in particular all the new species.

Accumulations of material in the Store from the Malay and Philippine Islands have also been dealt with and a preliminary sorting has been carried out. About 80 bundles of named specimens from the Malay Islands were sorted and the unmounted sheets arranged in genus and species covers and replaced in the Asiatic Room in the Store. Some 200 bundles of named Philippine Islands material are being treated in the same way. In each case examples of new genera and species are taken out and laid in and any duplicate material is set aside for distribution.

Research and Publications.—Work was continued on the revisions of the Chinese species of important horticultural genera. The ms. of those on *Cotoneaster* and *Pyracantha* has been prepared and progress has been made with the revisions of *Buddleia* and *Gentiana*.

AFRICA.—*Routine*.—The principal work has consisted in naming East African material. This included numerous collections received from the East African Colonies during the year and the very large Stolz collection from Tanganyika in the Store, which was commenced last year. The latter was completed and the duplicates have been distributed. A considerable amount of West African material was also dealt with, including about 450 sheets received on loan from Paris for citation in the Flora of West Africa. In the same connection Thomas's Sierra Leone collection is being gradually worked up and duplicates prepared for distribution. In the Store all the Mildbraed plants from the Cameroons, and Gossweiler's plants from Angola have been laid out and mounted.

The revision of the material of *Compositae* for the Pretoria Herbarium was continued, and also a large number of sheets of the same family from the Transvaal for Prof. C. E. Moss. All the African specimens of the Angraecoid orchids have been arranged according to Dr. Schlechter's "Natürlichen Neuordnung." Over 600 specimens of grasses from various parts of Africa were determined. Many of these were received in small consignments and needed critical examination. The African material of the first 30 genera of the *Gramineae* is now completely arranged according to Dr. Stapf's arrangement in the Flora of Tropical Africa.

Research and Publications.—In connection with the Flora of West Africa, now in preparation, the Herbarium of the Museum

d'Histoire Naturelle, Paris, was visited in order to examine the wealth of material there and the many type specimens in Dr. Chevalier's herbarium. The first part of the Flora, after incorporating the notes made during this visit, has been completed and prepared for press. The Flora follows the arrangement set out in Hutchinson's "Families of Flowering Plants" and contains an analytical key to all the families represented in West Africa and about 100 drawings. The families dealt with include some of the most difficult such as *Anonaceae*, *Guttiferae*, *Combretaceae* and *Melastomaceae*.

In order to assist agriculturists in East Africa a small booklet containing illustrations and descriptions of common pasture grasses has been prepared and is now in the press. The following papers dealing with African botany were also published:—"Notes on Cyperaceae" (*K.B.*, 1925, p. 67), and "A revision of the genus Cassipourea" (*K.B.*, 1925, p. 241).

America.—*Routine*.—The determination of the various Mexican collections in the Store, including those of Palmer, Langlassé, Hancock and others, was practically completed during the year. A considerable portion of the material has been incorporated in the Herbarium, where, since many of the species were previously unrepresented, they will prove most valuable. In the case of the South American collections in the Store preference was given to British Guiana, and two large collections received respectively from the Botanic Gardens, Georgetown, and the Department of Science and Agriculture, British Guiana, were determined. Various collections from Colombia were also determined. Altogether over 4,000 specimens were named and over 21,000 specimens were laid in during the course of the year. Considerable progress was also made in the American Section of the Herbarium in the writing up and arranging of genera in accordance with recent monographs and revisions, those belonging to the *Euphorbiaceae*, *Urticaceae*, *Rubiaceae* and *Compositae* especially being dealt with. Many of Glaziou's Brazilian plants, which previously were only named generically, have, with the help of the systematic list of his collections, been specifically determined.

Research and Publications.—Amongst the investigations undertaken were the revision of the genus *Ryania*; an investigation into the botanical identity of the Brazil nut of commerce; and the analysis of Linden and Planchon's extremely rare work entitled "Plantae Columbianae" with identifications of the new species described therein (*Kew Bulletin*, 1926, p. 32). Fully indexed itineraries have been prepared and published of Humboldt and Bonpland's travels in Venezuela (*K.B.* 1925, p. 295), and those on the travels in Colombia, and in Ecuador and Peru, are in the press. These itineraries have proved most helpful in the identification of material from Northern South America.

In connection with the proposed 'Flora of Trinidad and Tobago,' the identifications of the *Rubiaceae* recorded in the

literature from those islands were investigated, with the result that at least 10 per cent. of the species listed were found to be wrongly determined. This work occupied a considerable amount of time and involved a large amount of taxonomic and bibliographical research. It was found that the flora was very inadequately represented even in the great Herbaria of the world and that many of the genera were greatly in need of revision.

AUSTRALIA AND POLYNESIA.—*Routine.*—The routine in the Australian Section was interrupted by the appointment of the Assistant in charge (Major K. W. Braid) to be Professor of Botany of the West of Scotland Agricultural College. The work is being carried out by his successor, and it is satisfactory to record that not only have the small collections received from all parts of the Commonwealth of Australia and the Dominion of New Zealand been dealt with, but a commencement has been made with the material in the Store.

A special attempt was made to deal with the large supplies of FIJIAN plants, forwarded at intervals by Mr. W. Greenwood from Fiji, but owing to special difficulties the work proceeds slowly.

The collection of NEW GUINEA orchids received from the late Dr. Schlechter has been laid in and the opportunity taken to arrange the New Guinea material of *Bulbophyllum*, *Calanthe*, and *Taeniophyllum* and other genera in accordance with Dr. Schlechter's "Die Orchidaceen von Deutschen Neu Guinea."

Research.—A paper entitled "A revision of the Genus Alphitonia" was published in the *Kew Bulletin*, 1925, p. 168. In response to a request from Mr. C. T. White, preparations were made to revise the Australian species of the genus *Aristida*, and a considerable amount of material was collected together from the various botanical departments in the Commonwealth. It was learned, however, that the entire genus was being monographed by Dr. Henrard, of Leiden, and all the material was therefore forwarded to him. A considerable number of new species of *Frankenia* have been detected in the Herbarium and a revision of all the Australian species of the genus has been commenced.

VASCULAR CRYPTOGAMS.—Owing to the pressure of work on important economic groups, the *Pteridophyta* and *Bryophyta* have necessarily been much neglected for many years and it is satisfactory to record that as a result of additional assistance for clerical work Mr. C. H. Wright has been able to devote considerable time to the naming and laying in of the ferns, and to continue writing up the collection according to Dr. C. Christensen's "Index Filicum." The latter, however, will entail much time, as many critical forms will have to be separated out from old composite species. Large accumulations of ferns exist in the Store and an even greater number of *Bryophyta*, but it is hoped now gradually to take in hand the naming of these collections. Some 1,500 tracings of Stephani's drawings of *Hepaticae* were laid in, which, representing as they do so many rare and type species, are of great value.

THALLOPHYTA.—*Routine.*—Several collections of Marine Algae were laid in and a certain number of Lichens. A commencement was also made with the re-arrangement of the boxes of the saxicolous Lichens according to Zahlbruckner's monograph, a lichenologist, Miss D. Powell, being specially employed for the purpose.

In the Mycological section a most valuable collection was received from Mr. T. Petch, consisting of nearly 2,500 specimens of Ceylon fungi collected and named by him, many of them being types or syntypes. A number of miscellaneous additions have also been received, including an interesting collection of New Zealand rusts and smuts, presented and determined by Mr. C. H. Cunningham. Though partly incorporated the laying in of these collections has been held up through lack of space, but the over-crowding has now been relieved by the addition of the new cabinets in each bay. In connection with the routine work of the mycological section, acknowledgments are due to Mr. C. G. Lloyd, who, during his absence from England, has for the second year kindly allowed his typist to be employed for about three-quarters of her time on Kew work.

Research and Publications.—A critical examination and partial naming of a collection of species of *Poria* from Australia was undertaken and a revision was prepared of the recorded species of *Cystopus* from South Africa; the latter account will shortly be published in *Bothalia*. A list has also been drawn up, and will be published in the *Kew Bulletin*, of the fungi known to occur in Kenya Colony, the list being based on published records and on a critical revision of the material in the Herbarium. Additional apparatus for mycological investigation has been installed in the Jodrell Laboratory, and, with the aid of this, further research has been undertaken in connection with the biology of *Cercosporella Antirrhini* Wakef. and *Rhizoctonia crocorum* DC. and with taxonomic investigations of the genus *Vermicularia*.

STOREHOUSE.—The work of the special Store staff which consists of four botanists and eight preparers was, as in 1924, distributed on a geographical basis, a botanist with two preparers being assigned respectively to the European, Asiatic, African and American rooms in the Storehouse. During the year under review the work of laying out, mounting and poisoning has proceeded satisfactorily and at a slightly higher rate than for the five months during which the staff was employed in 1924. Excellent progress was made by the botanists in their tasks of sorting named material, determining the unnamed, and in the laying in of the sheets. Owing to the congestion in the Herbarium pending the installation of new cabinets, much of the material dealt with had to be temporarily arranged on shelves in the Store. The work carried out by the special staff is included under the geographical headings already dealt with.

Summary of Routine.—The following table summarises the routine work accomplished by the regular staff and by the special Store staff during 1925, the lower Cryptogams being excluded:—

Laid out	Approx. 77,600
Mounted	92,310
Incorporated in the Herbarium ...	44,243
Duplicates distributed	20,409
Specimens received on loan	7,077
Specimens sent out on loan	6,001

Seed and Carpological Collections.—About 300 samples have been added to the seed collection during the year and about 100 samples to the carpological collection. All the additional material is incorporated and both collections are now in good order. The value of a separate seed collection for the purpose of naming has been much emphasized during the identification of samples from various parts of the world, when the great rapidity in matching genera and species as compared with using herbarium sheets is very striking.

Nomenclature.—Numerous enquiries from various institutions and from botanists, with reference to the names which should be adopted in particular cases under the International Rules of Nomenclature, have been dealt with, and answers have been sent to many questions connected with orthography and bibliography. Among the subjects which have received attention are those of "nomina conservanda" and "standard-species." The Committee on Australian Botanical Nomenclature, appointed by the Australasian Association for the Advancement of Science in 1924, communicated reports of their proceedings, and a précis which was published (*Kew Bull.* 1925, p. 343, and Journal of Botany, 1925, p. 210), in order that the proposals of the Committee may be accessible to botanists in other parts of the Empire and in foreign countries, and also may receive adequate consideration before the International Botanical Congress to be held at Ithaca in August, 1926.

It is gradually becoming recognised that in order to secure certainty in the application of generic names, each of these should be associated with a definite species, the so-called "standard-species." An investigation into the standard-species of the Linnean genera of *Tetradynamia* (*Cruciferae*, with the genus *Cleome*) was published in *Kew Bull.* 1925, p. 49, standard-species being proposed for the thirty-one generic names concerned. As a result of valuable constructive criticism received from Prof. Thellung, further examination was given to the cases of *Lepidium* and *Biscutella*, and the standard-species proposed for these names were altered. The thirty-one species now recommended may be regarded as free from objection (*K.B.*, 1925, p. 315).

Index Kewensis.—Steady progress has been made during 1925 with the printing of the sixth Supplement to the *Index Kewensis*, covering the period 1916–1920. The first sheet of proof was received from the press in February, 1925, and six-sevenths of the

work (24 sheets out of 28), comprising the genera *Aa-Senecio*, were in print at the end of the year. It is anticipated that the volume will be published in the first half of 1926.

The compilation of the seventh Supplement has been progressing simultaneously with the printing of the sixth, and by the end of the year 1925 it comprised about 9000 separate entries. The seventh and following Supplements will not only be printed in book form as heretofore, but will be preserved at Kew as a card-catalogue, a form which will enable the successive Supplements, as they appear, to be sorted into a single alphabetical series, thus greatly facilitating consultation. The preparation of Supplement VII concurrently with the printing of Supplement VI was made possible by a grant from the British Association for the Advancement of Science and by special facilities afforded by the Council of the Royal Horticultural Society. It is also satisfactory to record that a permanent post of assistant for the Index Kewensis was created and filled (*see Kew Bulletin* 1926, p. 142).

Three further instalments of "Additions to the Index Kewensis" were published during the year (*K.B.*, 1925, pp. 186, 311, 344), relating respectively to names which appeared for the first time in Crantz, Classis Cruciformium (1769), and in Vellosia, ed. 1 (1888) and ed. 2 (1891), and to others generally regarded as "nomina nuda," but which were validated by description in G. Don's General System. During the three years 1923–25 the number of supplementary entries made relating to the period covered by the original Index Kewensis and the first five Supplements amounted to about two thousand.

Experimental Ground.—The new plot to the west of the Herbarium was prepared for use in the spring and during the year 200 species were cultivated in it. The value of such a plot to the systematic botanist can hardly be over-estimated. In every country there exist genera with a multitude of forms the true nature of which baffles the systematist, and these often differ from those of neighbouring countries. It is only by growing such plants under uniform conditions and studying them in the living state, with due regard to such questions as segregation and the stability of characters, that the taxonomist can hope to make any progress on sound lines.

The plants grown in 1925 were mostly from Spain and the Balkan Peninsula, derived from seeds collected during visits by members of the staff or received subsequently as a result of such visits. A number of critical species of some dozen genera were studied in the living state and in their various stages of growth. Several of these proved to be totally unrepresented in the Herbarium, including the following which were new:—*Veronica pontica* Turrill, *Dianthus* sp. nov., *Verbascum luteo-viride* Turrill, and *Verbascum Blattaria* var. *luxurians* Turrill, whilst two other species were sufficiently important to be figured for the Botanical Magazine. About 250 sheets of specimens were dried, mounted and laid in, in addition to other sheets which were prepared for exchange purposes.

Inheritance and hybridization-phenomena were studied in *Centaurea "diffusa," Galeopsis Tetrahit*, and *Solanum dulcamara*. Work on the first-named will be extended and several varieties and strains have been collected.

Another function served by the experimental plot was manifested during the year, namely distribution to scientific workers of seeds of plants of critical species from definite wild localities. The superiority of such material to that supplied by ordinary garden plants for geneticists and other investigators is becoming increasingly apparent.

VISITORS.—About 5770 visits have been made to the Herbarium during the year. Amongst those who have paid frequent visits or made a prolonged stay were:—Alston, Mr. A. H. G., Dept. of Agriculture, Ceylon (Revision of *Cassipourea*); Babcock, Prof. E. B., University of California (Genetics of *Crepis*); Badami, Mr. V. K., Cambridge (*Arachis hypogea*); Baker, Mr. E. G., British Museum (African *Leguminosae*); Blake, Dr. S. F., Dept. of Agriculture, Washington (American *Compositae*); Bolus, Mrs. L., Bolus Herbarium, Cape Town (*Mesembryanthemum, Watsonia*); Brown, Mr. N. E. (South African plants); Buller, Prof. A. H. R., University of Manitoba, Winnipeg (Mycology); Burkill, Mr. I. H. (Malay Peninsula plants); Burtt-Davy, Dr. and Mrs. J., Imperial Forestry Institute, Oxford (Flora of the Transvaal); Chandler, Miss M. E. J. (Fossil seeds and fruits); Compton, Prof. R. H., Cape Town (South African and New Guinea plants); Cowan, Mr. and Mrs. A. M., Indian Forestry Service (Sikkim collections); Craib, Prof. W. G., Aberdeen (Siamese plants); Czeczott, Mrs. Hanna, Cracow (Plants of Anatolia); Dastur, Mr. R. H., University College, Reading (Marine algae); David, Mr. A. N., Forest Products Board (Timber Research); Dixon, Mr. H. N., Northampton (Mosses); Erlanson, Mrs. E. W., University of Ann Arbor, Michigan (American Roses); Fawcett, Mr. W., British Museum (Botany of Jamaica); Fedtschenko, Prof. B., Leningrad (Various plants); Fourcade, Mr. H. J., South Africa (South African plants); Fraser, Mr. J., (Garden plants); Gamble, Mr. J. S., Liss (Flora of Madras); Geddes, Miss E. J., Aberdeen University (Siamese plants); Grove, Mr. W. B., Birmingham (Fungi); Guthrie, Miss L., Bolus Herbarium, Cape Town (South African Monocotyledons); Haines, Mr. H. H., Wimborne, Dorset (Indian Botany); Hall, Dr. H. M., University of California (American *Compositae*); Hall, Mrs. Carlotta, University of California (North American ferns); Hall, Mr. L., Messrs. Cross and Bevan's Laboratories (Plant Chemistry); Hauman, Prof. Louis, National Museum, Buenos Aires (Botany of the Argentine); Henry, Prof. A., University College, Dublin (Forestry); Hohenkerk, Mr. L. S., British Guiana Forestry Dept. (Plants of British Guiana); Jackson, Mr. A. Bruce, Kew (*Cotoneaster*); Jones, Mr. E. Marsden, Devizes (Genetics); Kerr, Dr. A. F. G., Bangkok (Flora of Siam); Killip, Dr. E. P., Dept. of Agriculture, Washington (*Passiflora*); Kingdon Ward, Capt. F. (Rhododendrons, Flora of Tibet); Lloyd

Praeger, Dr. R., Dublin (*Crassulaceae*); Magnusson, Dr. A. H., Göteborg, Sweden (Lichens); Mason, Mr. E. W., Imperial Bureau of Mycology (Fungi); Massey, Mr. R. E., Khartoum (Grasses of the Sudan); Moore, Mr. S., British Museum (General Botany); Moss, Prof. C. E., University of Witwatersrand, Johannesburg (Transvaal plants); Osmaston, Mr. A. E., Indian Forest Service (Indian plants); Paulsen, Mr. R., Pinner (Lichens); Perez, Madame, (Bibliography of Canarian Flora); Reid, Mrs. E. M., Milford-on-Sea (Fossil seeds and fruits); Ridley, Mr. H. N., Kew (Plants of Borneo and Sumatra); Riley, Mr. L. A. M. (Plants of "St. George" Expedition); Robyns, Dr. W., Botanic Gardens, Brussels (African *Rubiaceae*); Roffey, Rev. J. (*Hieracium*); Rogers, Rev. F. A. (South African plants); Ryan, Mr. G. M. (Forestry); Salmon, Mr. C. E., Reigate (British Botany); Schindler, Dr. A. K., Jutebog, Germany (Monograph of *Desmodium*); Shabetai, Mr. J. R., Cairo (Flora of Egypt); Simpson, Mr. N. D., Cairo (Egyptian plants); Snelling, Miss L., St. Mary Cray (Botanical Magazine); Stapf, Dr. O. (Botanical Magazine, Pritzel's Index Iconum); Stojanoff, Prof. N., Sofia (Flora of Bulgaria); Westerdijk, Prof. Johanna, Baarn, Holland (Fungi).

The work accomplished by visitors not only contributes to botanical science as a whole but, as the notes below show, is often of direct importance to Kew, especially with regard to the floras of the distant parts of the Empire.

The work of the following visitors was carried out almost exclusively at Kew. Dr. O. Stapf, who throughout the year continued work as editor of the Botanical Magazine and of the new edition of Pritzel's Index Iconum, the former task involving much critical study and revision of genera. Mr. H. N. Ridley has completed the publication of his Flora of the Malay Peninsula, which deals only with the phanerogams (*see K.B.*, 1925, p. 399), and has prepared an account of the ferns, which will appear in the Journal of the Asiatic Society, Straits Settlements Branch. Mr. Ridley has also published an enumeration of the plants collected in Bencoolen, Sumatra (*K.B.* 1925, p. 76). Mr. N. E. Brown published a paper on new species of *Indigofera* from the Transvaal and Swaziland (*K.B.*, 1925, p. 142), and continued his studies on *Mesembryanthemum*, publishing his results periodically in the Gardeners' Chronicle.

Before leaving to take up his appointment as Lecturer in Forest Botany at the Imperial Forestry Institute, Oxford, Dr. J. Burtt Davy continued the preparation of a Flora of the Transvaal. Mr. I. H. Burkill, on his retirement from the Directorship of the Botanic Gardens, Straits Settlements, has worked regularly at Kew on plants from the Malay Peninsula, especially *Dioscorea* and on the economic botany of that region.

Of other botanists engaged on important work though for shorter periods mention may be made of Mr. J. S. Gamble, who until his lamented death (*see K.B.* 1925, p. 433), paid regular visits in connection with his Flora of the Presidency of Madras, Part VII

of which was published in Dec. 1925, three months after his death; Prof. W. G. Craib and his assistant, Miss E. J. Geddes, spent some time at Kew on critical work on the Siamese flora, and Dr. A. F. G. Kerr, Director, Botanical Section, Ministry of Commerce, Siam, who determined a large number of the Siamese orchids, which he has been collecting for many years. Additamenta Nos. XV, XVI, and XVII to the Contributions to the Flora of Siam were published in Nos. 1, 9 and 10 of the *Kew Bulletin*, 1925, the last two consist of new orchids (all but one of which were named but not described by the late R. A. Rolfe), and were edited by Miss D. G. Downie. It may be noted further that a separate work entitled Florae Siamensis Enumeratio is being published under the auspices of the Siam Society, Part 1 of which appeared in March, 1925. Mr. L. A. M. Riley also paid numerous visits and published three papers dealing with notes on plants of Madeira, of Trinidad and of the Galapagos Islands collected by the "St. George" Expedition (*K.B.* 1925, pp. 26, 133, 216).

Numerous botanists visiting England from the Colonies and Dominions spent a considerable time in the Herbarium, notably Mrs. F. Bolus, Honorary Curator of the Bolus Herbarium, National Botanic Garden, Kirstenbosch, and Miss L. Guthrie, who were engaged on working at South African Mesembryanthemums and Monocotyledons; Mr. R. E. Massey, Government Botanist, Khartoum, who completed his work on grasses for inclusion in the second edition of the Catalogue of Sudan plants, which he is preparing in collaboration with Mr. A. F. Broun; also Prof. C. E. Moss, Prof. R. H. Compton, and Mr. L. S. Hohenkerk of the Forestry Department, British Guiana.

American workers were represented by Dr. H. M. Hall, of the University of California, who worked with various American *Compositae*, and Prof. E. B. Babcock of the same University, who was engaged on a systematic study of *Crepis* with a view to subsequent genetical work. Dr. Hall was accompanied by his wife, Mrs. Carlotta Hall, who dealt with ferns, especially the genus *Pellaea*. North American *Compositae* were also studied by Dr. S. F. Blake of Washington.

Of other notable foreign visitors mention can only be made of Dr. A. K. Schindler, who spent some five weeks at Kew in connection with his monograph of *Desmodium* and its allies for the Pflanzenreich ; Prof. N. Stojanoff, who continued his work on the flora of Bulgaria, and Dr. Robyns, who, prior to his expedition to the Belgian Congo, continued his studies on African *Rubiaceae* and prepared a monograph, now awaiting publication, on the genus *Vangueria* and its allies.

Additions to Herbarium.—The total number of specimens acquired during 1925 was 80,013, of which 3,581 were purchased, the remainder being received as donations or exchanges. The chief sources from which these were obtained were as follows :—

Europe.—*Presented :* Britain, by Mr. E. Thurston, Mr. C. E. Salmon, Mr. C. E. Britton, Col. H. H. Johnston, and the

Botanical Exchange Club per Mr. W. O. Howarth; Belgium, by the Jardin Botanique de l'Etat, Brussels; France (coll. Croizette Desmogens), by Mr. J. S. Gamble; Flora Roumaniae Exsiccata, Cent. 2, 4 and 5, by Cluj University; Cryptogamia Exsiccata, Cent. 29, by the Vienna Naturhistorisches Museum; Bosnia, 778 specimens by Dr. K. Maly; Moravia (coll. Podpera) by Brno University; Iter Tanaicense, by Prof. J. Novopokrowsky; Pyrenees, Rev. E. Ellman; Balkan Peninsula, by Mr. and Mrs. Turrill.

Purchased: Mr. D. McArdle, Irish *Charophyta*, etc.; Dr. E. M. Reineck, Central Europe, and Plantae Europae Orientales, part 2; Mr. A. A. Grossheim, Plantae Orientales Exsiccatae, fasc. 1–8, nos. 1–200.

NORTH AFRICA.—*Presented:* Morocco (coll. E. Jahandiez), by Mr. L. Johnston.

ATLANTIC ISLANDS.—*Presented:* Canary Islands, by Mr. Herman Spooner.

CHINA.—*Presented:* Fukien, 314 specimens by Prof. H. H. Chung; Kansu (coll. R. C. Ching), by the United States National Museum; Yunnan and E. Tibet, 1900 specimens (coll. G. Forrest, 1921–22), by the Royal Botanic Garden, Edinburgh; Yangtze Watershed and Valley, Yunnan (coll. J. F. Rock), by the United States National Museum; Hongkong, etc. (coll. Col. W. Robinson), by Mr. Wellesley H. Robinson; E. Tibet, 712 specimens (coll. Capt. F. Kingdon Ward), by the Royal Botanic Garden, Edinburgh.

Purchased: Canton Christian College, Hainan, coll. F. A. McClure.

INDIA.—*Presented:* India, private herbarium (about 50,000 sheets), by Mr. J. S. Gamble; residue of Johann Peter Rottler's herbarium, by King's College, London (see *Kew Bull.* 1894, p. 200); Madras, by the Royal Botanic Garden, Calcutta, and the Madras Government Herbarium, selected by permission by Mr. J. S. Gamble; United Provinces, by the Forest Research Institute and College, Dehra Dun; Kashmir, by Mr. B. O. Coventry; Ceylon *Fungi* 2,450 specimens including many syntypes, by Mr. T. Petch; seeds, by Mr. B. Gill; Maymyo, by Mr. C. E. Parkinson; Kashgar Mountains, by Mr. C. P. Skrine.

MALAY PENINSULA.—*Presented:* various, by the Botanic Gardens Department, Straits Settlements.

INDO-CHINA.—*Presented:* Siam (coll. Dr. A. F. G. Kerr and Nai Noe), by Dr. A. F. G. Kerr; Siam (coll. Phra Winit Wanadorn), by the Siamese Forestry Service; Siamese Mosses, named by Mr. H. N. Dixon, by Prof. W. G. Craib.

MALAY ISLANDS.—*Presented:* 700 sheets from various islands, by the Buitenzorg Botanic Garden; Borneo (coll. Castro and Melegrito), by Dean E. D. Merrill; Sumatra (coll. H. S. Yates), by Dean E. D. Merrill, and (coll. C. Boden Kloss)

by the Director, Botanic Gardens, Singapore, and (coll. Robinson and Kloss) by the British Museum (Natural History).

PHILIPPINES.—*Presented:* (coll. A. Loher and M. Ramos), by Dean E. D. Merrill.

NEW GUINEA.—*Presented:* (coll. Dr. G. Bryce), by the New Guinea Department of Agriculture,

AUSTRALIA.—*Presented:* Nowra, New South Wales, by Dr. F. A. Rodway; Western and Northern Australia, by Dr. Herbert Basedow; various, by the Sydney Botanic Gardens.

Purchased: G. Weindorfer, mountains of Tasmania.

NEW ZEALAND.—*Presented:* various, by Mr. H. Carse.

POLYNESIA.—*Presented:* Fiji, by Mr. W. Greenwood; Samoa, by Mr. P. A. Buxton; Hawaii, by Mr. I. H. Burkill; Austral Islands, etc., coll. St. George Expedition, by the Scientific Expeditionary Research Association.

TROPICAL AFRICA.—*Presented:* Southern Nigeria (coll. Mr. and Mrs. A. Talbot), by the British Museum; Angola, by Mr. J. Gossweiler; Belgian Congo, by the Jardin Botanique de l'État, Bruxelles; Uganda, by Mr. J. D. Snowden; Kenya Colony, by the Department of Agriculture and the Forestry Department, and by Drs. R. E. and Th. C. E. Fries (548 specimens); Tanganyika Territory, by the Department of Agriculture and the Conservator of Forests; West shore of Lake Tanganyika (coll. Mrs. M. D. Flynn), by Miss M. C. Knowles; various, by the Museum d'Histoire Naturelle, Paris.

MASCARENE ISLANDS.—*Presented:* Madagascar, co-types of new species, by Mons. H. Perrier de la Bâthie.

SOUTH AFRICA.—*Presented:* Mesembryanthemums, etc., by the Bolus Herbarium; *Myricaceae* and *Cyperaceae*, by Mrs. M. R. Levyns; succulents, by Mr. N. E. Brown; Griqualand West, by Miss M. Wilman; various plants, by the Division of Botany, Department of Agriculture, Pretoria, Dr. J. Burtt Davy, Mr. Wellesley H. Robinson, the Rev. F. A. Rogers, Prof. Hans Schinz and the Commissioner of the South Africa Pavilion, British Empire Exhibition, Wembley.

NORTH AMERICA.—*Presented:* North American Grasses, cent. 8, by the United States Department of Agriculture; various, by the Gray Herbarium, the United States National Museum, the California Academy of Sciences and Mr. I. H. Burkill.

Purchased: Mr. B. F. Bush, Missouri.

CENTRAL AMERICA.—*Presented:* various, by the United States National Museum; *Fungi*, Prof. F. L. Stevens.

WEST INDIES.—*Presented:* various, by the Trinidad Department of Agriculture; Trinidad ferns, by Archdeacon A. Hombersley.

Purchased: Mr. W. Broadway, Trinidad.

EAST TROPICAL SOUTH AMERICA.—*Presented:* Brazil, Ceara, by Mr. G. C. Bolland; British Guiana (coll. R. A. Altson), by the Department of Science and Agriculture, and 350 specimens (coll. J. L. de la Cruz), by the New York Botanical Garden; *Fungi*, by Prof. F. L. Stevens.

West Tropical South America.—*Presented:* Colombia, 600 specimens (coll. F. W. Pennell, E. P. Killip and T. E. Hagen), by the Academy of Natural Sciences, Philadelphia (see Ann. Report Acad. Nat. Sci., Philadelphia, 1923, pp. 15–28); Galapagos Islands (coll. Alban Stewart), by the Californian Academy of Sciences, and (coll. "St. George" Expedition), by the Scientific Expeditionary Research Association.

Purchased: Mr. Cyril Allen, Colombia.

Temperate South America.—*Presented:* Uruguay, by Dr. F. Felippone.

Purchased: Dr. E. Werdermann, Chili.

General.—*Purchased:* G. Polacci and A. Nannizzi, I Miceti Patogeni, fasc. 4.

The Bentham Trustees have presented Mrs. Lugard's drawings of Ngamiland plants (see *Kew Bull.*, 1925, p. 348), and 34 original drawings made by Miss Drake for Lindley's "Sertum Orchidacearum." Five hundred additional tracings of F. Stephani's drawings of *Hepaticae* have been purchased from Miss J. Stephani, many of them of species not previously represented at Kew and possibly of unique specimens.

The Library.

In the obituary notice of Dr. J. E. T. Aitchison, published in the *Kew Bulletin*, 1898, p. 310, it is stated that "for some time previous to his death he was engaged collecting materials for a *Flora Indiae Desertae* (i.e., North-west India, Afghanistan and Baluchistan), but his sufferings prevented him from working them out." These "materials" in the form of 8 packets of manuscript, each about 2 inches thick and of small quarto size, came last year into the possession of Dr. Aitchison's old friend, Major-General Sir R. Havelock Charles, G.C.V.O., and he, on the advice of Lieut.-Col. Sir David Prain, has presented them to the Royal Botanic Gardens, Kew. Though far from being in a fit state for publication they are likely to be of much use to other workers in the same field. It appears to have been Dr. Aitchison's purpose to prepare an extended edition of the work he published in the *Transactions of the Botanical Society of Edinburgh*, vol. xviii, pp. 1–226 (1891).

The Bentham Trustees have presented the following:— (1) An excellent copy of the Oxford edition (1723) of the writings of Aretaeus of Cappadocia in Greek and Latin. The Latin title reads:—*De causis et signis acutorum et diuturnorum morborum libri quatuor; de curatione morborum libri quatuor. Cum MSS. duobus, Harleyano et Vaticano, contulit, novamque versionem dedit Johannes Wigan.* (2) A copy in 5 octavo volumes of the work by F. A. P. de Garsault, *Description, vertus et usages de sept cents dix-neuf plantes . . . . gravées sur les desseins d'après nature*, Paris, 1764–67, which contains some doubtful binomials for which priority has been claimed. A note concerning this work was published in the *Journal of Botany*, 1909, p. 322. (3) *Oriental memoirs*, by James Forbes,

second edition, 1834–35. (4) A collection of 245 water-colour drawings of Ngamiland plants, by Mrs. Lugard, to which reference is made in *K.B.* 1925, p. 348. (5) 34 original drawings for Lindley's *Sertum Orchidaceum* by Miss Drake and others.

The Carnegie Institution of Washington has presented 4 more volumes of its botanical publications, namely:—F. E. Clements and G. W. Goldsmith, *The phytometer method in ecology: the plant and community as instruments* (no. 356, 1924); F. E. Clements and J. E. Weaver, *Experimental vegetation: the relation of climaxes to climates* (no. 355, 1924); W. S. Cooper, *The broad-sclerophyll vegetation of California* (no. 319, 1922); and D. T. MacDougal, *Reversible variations in volume, pressure, and movements of sap in trees* (no. 365, 1925).

Prof. O. V. Darbishire has presented the two handsome volumes, *The Plums of New York*, 1911, and *The Cherries of New York*, 1915, by U. P. Hedrick and others, which formerly belonged to his cousin, the late Mr. A. D. Darbishire.

The manuscript list of the late Mr. J. S. Gamble's Herbarium, which he had presented to the Royal Botanic Gardens, Kew, was received from him shortly before his death. It consists of 11 volumes of various sizes. Mr. Gamble also presented a copy of *Man and nature; or physical geography as modified by human action*, by G. P. Marsh, 1864, and his working copies of several books, in some of which there are annotations and other manuscript matter, have been received from Mrs. Gamble. These include a complete set of Hooker's *Flora of British India*, Roxburgh's *Flora Indica* (Clarke's reprint), Brandis's *Indian trees*, Bourdillon's *Forest trees of Travancore*, Wight and Walker-Arnott's *Prodromus florae Peninsulae Indiae orientalis*, Mr. Gamble's *Manual of Indian timbers*, second and third editions, and his *Bambuseae of British India*.

A set of the *Travaux poursuivis au Laboratoire général des Productions coloniales, resumés par F. Heim*, 1920–25, published by the Comité d'Encouragement aux Recherches scientifiques coloniales, Paris, have been received from Prof. F. Heim de Balsac, and the first 3 fascicles of a new periodical, *Riz et Rizicultur*e, published under his direction, have been presented by the Agence générale des Colonies, Paris.

A selection from the botanical correspondence of the late Dr. W. Botting Hemsley, consisting of 425 letters, has been received from his daughter, Mrs. E. H. Lovelock.

Dr. B. Daydon Jackson has presented the corrected proofs (in 4 volumes) and the corrected revises (in 6 volumes) of the *Index Kewensis*, the manuscript of which is preserved at Kew.

During the year 2 more parts (63 and 64) of Mr. J. H. Maiden's *Critical revision of the genus Eucalyptus* have been received from the author, the sad news of whose death has recently reached us. It was Mr. Maiden's purpose to complete his great work on *Eucalyptus* in about 70 parts, and then to prepare a key to all the species of the genus.

Dean E. D. Merrill has presented 2 more fascicles (vol. i, fasc. 3 and 4) of his *Enumeration of Philippine flowering plants*, and a typed copy of A. D. E. Elmer's *Field notes on Philippine plants*, nos. 7037 to 18477, forming 3 rather thick foolscap folio volumes. It is also due to the kind offices of Dean Merrill that the library has been supplied with a complete set (20 numbers) of the *Technical Papers* published by the California Agricultural Experiment Station, and the journal *Hilgardia*, vol. i, nos. 1 to 7, in which form the *Technical Papers* are being continued.

Lieut.-Col. Sir David Prain has presented the year's issues of the *Berichte der Deutschen Botanischen Gesellschaft*, and the *Proceedings of the American Philosophical Society*, the *Year-Book of Pharmacy . . . and Transactions of the British Pharmaceutical Conference*, 1924, and tome xv of the *Travaux du Laboratoire de Materière médicale de la Faculté de Pharmacie de Paris*.

The following have been contributed by Dr. Otto Stapf:—*Ferns of Tropical Florida*, 1918, by J. K. Small; *Guia botanica da Praça da Republica e do Jardim da Luz*, São Paulo, 1919, by A. Usteri; and several reprints of papers by H. Handel-Mazzetti, including the continuation of his *Plantae novae sinenses*, published in the *Anzeiger der Akademie der Wissenschaften in Wien*.

The Trustees of the British Museum have presented a copy of the third edition of the *Monograph of the Mycetozoa*, by Arthur Lister, revised by Miss G. Lister, and a *Guide to the fossil plants in the Department of Geology and Palaeontology*.

A bound copy of the new edition of the *Catalogue of the . . . Library of the Linnean Society of London* has been received from the Council.

The Secretary of State for India has presented parts 1 and 6 of *The botany of Bihar and Orissa*, by H. H. Haines, completing the work, and *The English factories in India*, 1665–1667, by Sir William Foster.

The Crown Agents for the Colonies have sent 3 copies of *The useful trees of Northern Nigeria*, by H. V. Lely; *Gold Coast plant diseases*, by R. H. Bunting and H. A. Dade; and *The handbook of British Guiana*, compiled by M. S. Metzgen and H. E. C. Cain.

Meteorological extracts from the Blue Books of the British Crown Colonies and Protectorates for the year 1923 have been received from the Director of the Meteorological Office, Air Ministry.

Two copies of a map of British Guiana, dated 1913, have been received from the Colonial Secretary, British Guiana.

The last volume (the fifth) of *The Flora of the Malay Peninsula*, by H. N. Ridley, has been published during the year. A complete set has been presented by the Government of the Straits Settlements and Federated Malay States.

From the Editor of *Nature*:—Ida Colthurst, *Familiar flowering trees in India*; St. John Marriott, *British woodlands as illustrated by Lessness Abbey Woods*; Sir W. Schlich, *Manual of forestry*, vol. iii, ed. 5 (received through Mr. C. E. C. Fischer); L. D. Stamp,

The vegetation of Burma from an ecological standpoint (received through Major T. F. Chipp); J. E. B. Warming, *Oecology of plants*, second impression; J. Weathers, *My garden book*; and R. O. Williams, *Gardening in the Tropics*.

Books received from their publishers, all of which have been briefly reviewed in the *Kew Bulletin*:—E. Artschwager and E. M. Smiley, *Dictionary of botanical equivalents*, ed. 2, from the London agents of Messrs. Williams and Wilkins Company; L. H. Bailey, *The principles of vegetable-gardening*, ed. 18, and E. P. Felt, *Manual of tree and shrub insects*, from Messrs. Macmillan; E. T. Cook, *Gardening for beginners*, ed. 8, and W. Irving, *Rock gardening*, from Country Life; Ida Lee (Mrs. C. Bruce Marriott), *Early explorers in Australia*, from Messrs. Methuen; R. Morse and R. Palmer, *British weeds*, from Messrs. Benn Brothers; A. S. Hitchcock, *Methods of descriptive systematic botany*, and R. T. and F. W. Rolfe, *The romance of the fungus world*, from Messrs. Chapman and Hall.

The following are the more important presentations of books, including some reprints from journals, received from their authors, unless otherwise stated:—Oakes Ames, *Schedulae Orchidianae*, no. 8, and *Enumeration of Philippine Apostasiaceae and Orchidaceae*; H. Andres, *Die Pirolaceen des rheinischen Schiefergebirges*, etc. (1909), and Zusätze I and II; E. B. Babcock and H. M. Hall, *Hemizonia congesta: a genetic, ecologic and taxonomic study of the hayfield tarweeds*; L. H. Bailey, *Gentes herbarum*, fasc. v; F. R. S. Balfour, *Account of the botany of Peeblesshire* (reprinted from *The History of Peeblesshire*); H. Basedow, *Narrative of an expedition of exploration in North-western Australia*, 1918; Mrs. F. Bolus, Miss D. Barclay and E. J. Steer, *A book of South African flowers* (from Mrs. Bolus who has also presented *Nature Notes*, nos. 13–22, and 48 coloured plates of South African flowers issued by the Wild Flower Protection Society of South Africa); *Catálogo de las plantas existentes en el Jardín de Aclimatación de La Orotava*, 1923 (from Mr. H. Spooner); R. H. Cheney, *Coffee: a monograph of the economic species of the genus Coffea L.* (from the Department of Biology, Washington Square College, New York University); H. H. Chung, *A catalogue of trees and shrubs of China*; W. G. Craib, *Florae siamensis enumeratio*, part 1 (from the Siam Society, Bangkok); P. R. Dupont, *Essai sur la structure et de la flore de quelques îles madréporiques de l'Océan indien*; A. Engler (Editor), *Beiträge zur Flora von Africa*, LI; G. Forrest, *Field notes on some plants . . . found . . . in* 1924 (from Mr. J. C. Williams); H. A. Gleason, *Studies on the flora of Northern South America*, I–IV; A. A. Grossheim and B. Schischkin, *Schedae ad herbarium plantae orientales exsiccatae*, fasc. I–VIII; T. Ito, *Icones plantarum Japonicarum*, vol. i, nos. 3–6; H. H. Janssonius, *Mikrographie des Holzes der auf Java vorkommenden Baumarten*, Lfg. 7 (also a copy received from the Botanic Garden, Utrecht); W. L. Jepson, *Manual of the flowering plants of California*, signatures 1 and 13 to 40, completing the work; H. Johansen, *Handbook of the principal*

trees and shrubs of the Ancon and Balboa Districts, Panama Canal Zone; F. Kraenzlin, *Monographie der Gattungen Masdevallia*, etc.; Y. Kudo, 8 reprints including his *Flora of the Island of Paramushir* (from Dr. A. W. Hill); H. J. Lam, *The Sapotaceae . . . . of the Dutch East Indies*, etc.; R. Maire, *Études sur la végétation et la flore du Grand Atlas et du Moyen Atlas Marocains*; R. Majima, *Untersuchungen über den Japanlack*; S. C. Mason, *Date Culture in Sudan* (from Director, Department of Agriculture and Forests, Khartoum); Janet Perkins, *Übersicht über die Gattungen der Monimiaceae*, etc.; G. V. Perez, *A selection of botanical and other papers* (from Mrs. Perez); T. Petch, *Bibliography of books and papers relating to agriculture and botany* [*in Ceylon*] (from Director of Agriculture, Peradeniya); S. J. Record, *Bibliography of the woods of the world*, Supplement I; W. Robinson, *Wood fires for the country house and cottage*; J. L. Sager, *Studies in soil acidity*, 1923, and *The causes of rhythm in vital phenomena*, 1923; R. Schlechter *Orchidaceae novae et criticae*, Decades 1–77 (*Fedde, Repert.* ii–xx); D. F. van Slooten, *The Flacourtiaceae of the Dutch East Indies*; P. C. Standley and S. Calderón, *Lista preliminar de las plantas de El Salvador* (from the Smithsonian Institution); N. Stoyanov and B. Stefanov, *Flore de Bulgarie*, in Bulgarian (from the Bulgarian Ministry of Agriculture and Domains); H. Sydow, 79 mycological papers chiefly from the *Annales Mycologici*; D. Szymkiewicz, *Bibljografja flory Polskiej*; Allen Wedgwood, *Catalogue of the Wedgwood Herbarium*, 1920 (from Mrs. Wedgwood); E. H. Wilson, *America's greatest garden: the Arnold Arboretum* (from Prof. C. S. Sargent and C. M. Lewis); and Y. Yamamoto, *Supplementa Iconum plantarum Formosanarum*, I (from the Department of Forestry, Government Research Institute, Formosa).

Periodical and serial publications presented include:—*Acta Botanica Fennica*, Helsingfors, vol. i, no. 1, from Societas pro Fauna et Flora Fennica; *Acta Phytochimica*, Tokyo, vol. ii, nos. 2 and 3, from the Editor; Albany Museum, Grahamstown, *Records*, vol. iii, pt. 4, from the Committee of the Museum; *Anais do Instituto Superior de Agronomia*, Lisbon, vol. ii, from the Institute; *Annales Societatis Zoolog.-Botanicae Fennicae Vanamo*, Helsingfors, tom. i, from the Society; Arnold Arboretum, *Journal*, vol. vi, nos. 1 and 2, from Prof. C. S. Sargent; Australasian Association for the Advancement of Science, *Index to Reports*, vols. i–xvi, from the Association; *Bothalia*, Pretoria, vol. i, pt. 4, from Dr. I. B. Pole Evans; British Association for the Advancement of Science, *Report*, 1924, from Miss E. M. Wakefield; *Bulletins* issued by Messrs Sutton and Sons, Reading, nos. 1–14, from Messrs. Sutton; East Malling Research Station, *Reports*, from Director; *Empire Cotton Growing Review*, London, vol. ii, nos. 1 and 2, from the Editor; *Japanese Journal of Botany*, Tokyo, vol. ii, nos. 2 and 3, from the National Research Council, Japan; Kyushu Imperial University, Fukuoka, Japan, *Journal of the Department of Agriculture*, vol. i, nos. 1, 3 and 5, from the Director; Linnean

Society of New South Wales, *Historical notes* . . . . by A. B. Walkom, from the Society; London, Imperial Botanical Conference, 1924, *Report of Proceedings*, from the President and Executive Committee; Lyons, Société Linnéenne, *Annales*, 1924, and *Bulletin*, 1925, from Dr. A. W. Hill; *Memoirs of the National Academy of Sciences*, Washington, vol. xi, containing Prof. Trelease's work *The American Oaks*, from the Academy; *Orchid Review*, London, 1925, from the Editor; *Revista Argentina de Botanica*, La Plata, tomo i, nos. 2 and 3, from Prof. C. Spegazzini; *Science Reports of the Tohoku Imperial University*, Sendai, Japan, ser. 4, vol. i, no. 2, from the University; *Studies from the Tokugawa Institute*, Tokyo, vol. i, no. 1, from the Institute; *De Thee*, Buitenzorg, 5 numbers, from the Director, Theeproefstation; *Tropical Woods*, New Haven, U.S.A., nos. 1–4, from Prof. S. J. Record; Watson Botanical Exchange Club, *Annual Report*, 1924–25, from Mr. H. S. Thompson; and Yale University School of Forestry, *Bulletins*, nos. 9–13, from the School.

In addition to the societies, academies, and other institutions already mentioned the following have presented publications issued by them:—Royal Swedish Academy of Sciences, Stockholm; Royal University, Upsala; Danish Botanical Society and Botanical Garden, Copenhagen; Botanical Garden, Utrecht; Phytopathologisch Laboratorium "Willie Commelin Scholten," Baarn, Holland; Botanical Garden, Leningrad; Muséum National d'Histoire Naturelle, Paris; Botanical Museum, University of Zurich; Institute of Botany, University of Geneva; Faculty of Science, Masaryk University, Brno; Agricultural Research Institute Pusa; Indian Tea Association, Calcutta; Department of Agriculture, Peradeniya; Department of Agriculture, Buitenzorg; Bureaux of Science, Agriculture and Forestry, Philippine Islands; New Zealand Institute; Departments of Agriculture of Queensland, New South Wales, and Victoria; Agricultural and Commercial Society, Gold Coast; Department of Agriculture, Nigeria; Union of South Africa, Department of Agriculture; United States Department of Agriculture; Smithsonian Institution, Washington; Gray Herbarium of Harvard University; New York Botanical Garden; Brooklyn Botanical Garden; Cornell University Agricultural Experiment Station, Ithaca; Missouri Botanical Garden; Field Museum, Chicago; California Academy of Sciences; University of California; Direccion de Estudios Biologicos, Mexico; and the Museo Nacional de Historia Natural, Buenos Aires.

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BULLETIN OF MISCELLANEOUS INFORMATION Appendix III 1926
ROYAL BOTANIC GARDENS, KEW

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1926. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew.

HERBACEOUS PLANTS.

Abronia arenaria.

Acaena argentea.
glabra.
laevigata.
macrostemon.
myriophylla.
novae-zelandiae.
ovalifolia.
Sanguisorbae.

Acantholimon venustum.

Acanthus Caroli-Alexandri.
longifolius.
Schottii.

Achillea ageratifolia.
argentea.
chrysocoma.
Clavennae.
conjuncta.
decolorans.
filipendulina.
grandiflora.
impatiens.
impunctata.

Achillea—*cont.*
Kellereri.
ligustica.
macedonica.
nana.
odorata.
Ptarmica.
pyrenaica.
sarracenica.
sibirica.
taygetea.
tomentosa.
umbellata.
Wilczekii.

Aconitum Anthora.
— var. versicolor.
barbatum.
brevicalcaratum.
chinense.
Forrestii.
Napellus.
— var. carneum.
— var. giganteum.
— var. tauricum.
orientale.
uncinatum.

(799). 55—7. 1125. 11/26. Wy. & S., Ltd. **Gp. 50.** (4).

Aconitum—*cont.*
variegatum.
volubile.
vulparia.
Wilsonii.

Actaea eburnea.
spicata.
— var. arguta.

Actinomeris squarrosa.

Adenophora Bulleyana.
diplodonta.
ornata.

Adenostyles glabra.

Adlumia cirrhosa.

Adonis aestivalis.
annuus.

Aethionema amoenum.
armenum.
cappadocicum.
grandiflorum.
schistosum.

Agrimonia Eupatoria.
odorata.

Agropyron cristatum.
junceum.
sibiricum.
tenerum.

Agrostis alba.
canina.
capillaris.
nebulosa.

Aira caryophyllea.

Alchemilla acutiloba.
alpina.
conjuncta.
Hoppeana.

Alkanna lutea.
orientalis.

Allium acuminatum.
albo-pilosum.
angulosum.
Babingtonii.
Beesianum.
Bidwillii.
caeruleum.
cyaneum.
giganteum.
hymenorrhizum.
kansuense.
karataviense.
Libani.
macranthum.
Moly.
narcissiflorum.
neapolitanum.
nigrum.
Ostrowskianum.
oviflorum.
paradoxum.
pendulinum.
pulchellum.
recurvatum.
roseum.
Schoenoprasum.
Scorodoprasum.
scorzonerifolium.
senescens.
siculum.
sikkimense.
sphaerocephalum.
stellatum.
subangulatum.
subhirsutum.
yunnanense.
zebdanense.

Alonsoa linifolia.
Warscewiczii.

Alstroemeria aurantiaca.
haemantha.
— var. rosea.
pelegrina var. alba.

Althaea armeniaca.
cannabina.
ficifolia.
kurdica.
officinalis.
pallida.
rosea.
Sibthorpii.
taurinensis.

Alyssum amanum.
argenteum.
creticum.
incanum.
maritimum.
minimum.
saxatile.
serpyllifolium.
sinuatum.
spinosum.

Amarantus caudatus.
chlorostachys.
hypochondriacus.
polygamus.
retroflexus.

Amethystea coerulea.

Ammania japonica.

Ammobium. alatum.

Ammophila arundinacea.

Anacyclus clavatus.
officinarum.

Anaphalis margaritacea.
nubigena.

Anarrhinum bellidifolium.

Anchusa Barrelieri.
italica.

Androsace albana.
carnea var. brigantiaca.
lactiflora.
lanuginosa.
occidentalis.
primuloides.
sarmentosa.

Andryala Agardhii.

Anemone alpina.
Halleri.
japonica var. hupehensis.
magellanica.
multifida.
patens.
pratensis var. montana.
Pulsatilla.
rivularis.
sylvestris.
— var. grandiflora.
virginiana.

Angelica ampla.

Anomatheca cruenta.

Antennaria dioica.
— var. tomentosa.

Anthemis Biebersteiniana.
carpathica.
Cupaniana.
Fussii.
Kotschyana.
macedonica.
mixta.
montana.
tinctoria.
— var. discoidea.

Anthericum Liliago.
—var. algeriense.

Anthriscus Cerefolium.

Anthyllis montana.
tetraphylla.
Vulneraria var. Dillenii.

Antirrhinum Asarina.
glutinosum.
majus.
Orontium.

Aplopappus croceus.
spinulosus.

Apocynum cannabinum.

Aquilegia canadensis.
chrysantha.
coerulea.
formosa.
glandulosa.
glauca.
Moorcroftiana.
nevadensis.
pyrenaica.
Skinneri.
truncata.
vulgaris var. stellata.

Arabis albida.
arenosa.
aubrietioides.
bellidifolia.
cenisia.
ciliata.
hirsuta.
incana.
muralis.
pumila.
verna.

Aralia cordata.

Arctotis stoechadifolia.

Arenaria aretioides.
austriaca.
balearica.
Bertolonii.
foliosa.
gothica.
graminifolia.
grandiflora.
gysophiloides.
Koriniana.

Arenaria—*cont.*
laricifolia.
liniflora.
montana.
pinifolia.
purpurascens.
sajanensis.
saxatilis.

Argemone alba.
mexicana.
ochroleuca.
platyceras.

Armeria alpina.
caespitosa.
canescens.
chilensis.
elongata.
fasciculata.
juncea.
latifolia.
— var. bracteata
leucocephala.
majellensis.
plantaginea.
pungens.
Welwitschii.

Arnebia cornuta.

Arnica amplexicaulis.
Chamissonis.
longifolia.
montana.
sachalinensis.

Artemisia coerulescens.
gnaphalodes.
integrifolia.
lactiflora.
Ludoviciana.
pedemontana.
procera.
rupestris.
sericea.
Stelleriana.

Asclepias syriaca.

Asperella Hystrix.

Asperula azurea.
galioides.
tinctoria.

Asphodeline liburnica.
lutea.

Asphodelus albus.
ramosus.

Aster acuminatus.
alpinus.
Amellus.
Bellidiastrum.
brachytrichus.
carolinianus.
Curtisii.
diffusus.
Douglasii.
Farreri.
foliaceus.
furcatus.
glaucus.
Herveyi.
heterochaetus.
himalaicus.
laevis.
likiangensis.
linariifolius.
Lipskyi.
longifolius.
macrophyllus.
multiflorus.
oreophilus.
Purdomii.
pyrenaeus.
Radula.
sibiricus.
staticefolius.
stellaris.
subcoeruleus.
tibeticus.
tricephalus.
Tripolium.
umbellatus.
Vahlii.
vestitus.
yunnanensis.

Astilbe chinensis.
koreana.
rivularis.
simplicifolia.
Thunbergii.

Astragalus alopecuroides.
aristatus.
chinensis.
chlorostachys.
frigidus.
hamosus.
Onobrychis.
pentaglottis.
sulcatus.
xiphocarpus.
Zingeri.

Astrantia Biebersteinii.
carniolica.
helleborifolia.
major.

Athamanta Haynaldii.
Matthiolii.

Baeria coronaria.

Ballota acetabulosa.
macedonica.
pseudo-dictamnus.
spinosa.

Baptisia australis.
— var. minor.
leucantha.
perfoliata.

Beckmannia eruciformis.

Bellium bellidioides.
minutum.

Bellis mexicana.
sylvestris.

Berkheya Adlamii.
purpurea.

Beta maritima.
trigyna.

Bidens cernua.
ferulaefolia.
leucantha.
tripartita.

Biscutella ambigua.
didyma.
laevigata.

Blumenbachia insignis.

Borago Trabutii.

Brachycome iberidifolia.

Brachypodium distachyum.
pinnatum.

Brassica alba.
balearica.
Cheiranthos.
Erucastrum.
napus var. dichotoma.
nigra.
oleracea.
Tournefortii.

Brickellia grandiflora.

Briza maxima.
minor.

Brodiaea congesta.
Hendersonii.
hyacinthina.
laxa.
multiflora.
peduncularis.
uniflora.

Bromus albidus.
ciliatus.
erectus.
japonicus.
macrostachys.
madritensis.

Bromus—*cont.*
maximus.
rubens.
secalinus.
tectorum.
unioloides.

Browallia demissa.

Bulbine annua.

Bulbinella Hookeri.

Bulbocodium vernum.

Bunias orientalis.

Buphthalmum salicifolium.
speciosum.

Bupleurum Candollei.
rotundifolium.
stellatum.

Butomus umbellatus.

Cakile maritima.

Calamagrostis Epigeios.
lanceolata.
littorea.
varia.

Calamintha alpina.
Clinopodium.
grandiflora.
Nepeta.
patavina.

Calandrinia grandiflora.
umbellata.

Calceolaria mexicana.
polyrrhiza.

Calendula arvensis.

Calla palustris.

Callirrhoe pedata.

Callistephus hortensis.

Caltha polypetala.
radicans.

Camassia esculenta.
Leichtlinii.
montana.

Camelina foetida.
sativa.

Campanula abietina.
alliariaefolia.
barbata.
cochlearifolia.
collina.
Erinus.
garganica.
glomerata.
Grossekii.
lactiflora.
lanata.
latifolia.
latiloba.
lingulata.
linifolia.
longestyla.
macrorrhiza.
Marchesettii.
patula.
persicifolia.
Portenschlagiana.
Raddeana.
Rapunculus.
rhomboidalis.
sarmatica.
sibirica.
speciosa.
Spruneri.
Stevenii.
versicolor.
Waldsteiniana.

Capsella grandiflora.

Carbenia benedicta.

Carduus arctioides.
defloratus.
nutans.
stenolepis.
tenuiflorus.

Carex axillaris.
binervis.
canescens.
crinita.
filiformis.
hordeistichos.
laevigata.
montana.
pendula.

Carlina acaulis.

Carthamus lanatus.
leucocaulos.
tinctorius.

Cedronella cana.
triphylla.

Celmisia verbascifolia.

Cenchrus tribuloides.

Cenia turbinata.

Centaurea albescens.
axillaris.
babylonica.
cynaroides.
dealbata.
Fontanesii.
glastifolia.
hypoleuca.
macrocephala.
melitensis.
montana.
phrygia.
pulchra.
rupestris.
ruthenica.
Sadleriana.
Salmantica.
Scabiosa var. alba.
solstitialis.

Cephalaria alpina.
tatarica.

Cerastium alpinum.
Biebersteinii.
Boissieri.
grandiflorum.
macranthum.
ovatum.
perfoliatum.
tomentosum.

Cerinthe glabra.
minor.

Chaerophyllum nodosum.
roseum.

Chamaelirium carolinianum.

Charieis heterophylla.

Chelidonium Franchetianum.

Chelone glabra.
obliqua.

Chenopodium amaranticolor.
ambrosoides.
Bonus-Henricus.
Botrys.
capitatum.
hybridum.
Nuttalliae.
Quinoa.
urbicum.

Chevreulia stolonifera.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum arcticum.
Aucherianum.
Balsamita.
carinatum.
caucasicum.
ceratophylloides.
cinerariaefolium.

Chrysanthemum—*cont.*
corymbosum.
densum.
Gayanum.
lacustre.
macrophyllum.
maximum.
monspeliense.
pallens.
roseum.
rotundifolium.
viscosum.
Zawadskii.

Chrysogonum virginianum.

Chrysopon Gryllus.

Chrysopsis villosa.

Cicer pinnatifidum.

Cicuta maculata.

Cimicifuga cordifolia.
dahurica.
foetida.
japonica.
racemosa.

Cirsium afrum.
arachnoideum.
canum.
eriophorum.
monspessulanum.
ochroleucum.
oleraceum.
stellatum.

Cladanthus proliferus.

Cladium Mariscus.

Clarkia elegans.
pulchella.

Cleome violacea.

Clintonia borealis.
umbellata.

Clypeola Jonthlaspii.

Cochlearia glastifolia.
saxatilis.

Codonopsis ovata.
tubulosa.

Collinsia bicolor.

Collomia coccinea.
gilioides.
grandiflora.

Commelina coelestis.

Conringia orientalis.

Convolvulus farinosus.
siculus.
tricolor.
undulatus.

Coreopsis grandiflora.
pubescens.
rosea.
verticillata.

Corispermum hyssopifolium.

Coronilla cappadocica.
montana.

Corydalis capnoides.
cheilanthifolia.
glauca.
lutea.
racemosa.
Semenowii.

Corynephorus canescens.

Cortusa Matthiolii.

Cotyledon libanotica.
simplicifolia.

Crambe cordifolia.
pinnatifida.

Crassula sarcocaulos.

Crepis blattarioides.
Dioscordis.
foetida.
grandiflora.
incana.
pygmaea.
rubra.
sibirica.

Crocus asturicus.
banaticus.
chrysantha.
etruscus.
Imperati.
laevigatus.
Malyi.
medius.
nudiflorus.
Salzmannii.
Sieberi.
speciosus.
Tommasinianus.
zonatus.

Crupina vulgaris.

Cuphea lanceolata.

Cyananthus lobatus.

Cynara Scolymus.

Cynoglossum amabile.
nervosum.
Wallichii.

Dactylis Aschersoniana.

Dahlia coccinea.
Merckii.

Datisca cannabina.

Datura inermis.
Tatula.

Delphinium amoenum.
atropurpureum.
Brunonianum.
cardiopetalum.
cashmirianum.
caucasicum.
Consolida.
elatum.
formosum.
grandiflorum.
hybridum.
nudicaule.
speciosum.
truncatum.
vestitum.

Deschampsia caespitosa.
calycina.
flexuosa.

Desmazeria sicula.

Dianthus arenarius.
Armeria.
arvernensis.
atrorubens.
barbatus.
caesius.
calocephalus.
capitatus.
carthusianorum.
Caryophyllus.
chinensis.
deltoides.
fragrans.
furcatus.
giganteus.
hirtus.
leptopetalus.
moesiacus.
Noeanus.
pallens.
petraeus var. spiculifolius.
pubescens.
pungens.
Requienii.
Seguieri.
squarrosus.
subacaulis.

Dianthus—*cont.*
superbus.
sylvestris.
tenuiflorus.
Waldsteinii.

Diarrhena americana.

Dicentra formosa.

Dictamnus albus.
— var. purpureus.
caucasicus.

Digitalis ambigua.
ferruginea.
laevigata.
lanata.
lutea.

Dimorphotheca aurantiaca.
hybrida.
pluvialis.

Dioscorea quinqueloba.

Dipcadi serotinum.

Diplachne fusca.
serotina.

Dipsacus asper.
chinensis.
fullonum.
inermis.

Disporum oreganum.
trachycarpum.

Dodecatheon Lemoinei.
Meadia.
radicatum.

Dorycnium hirsutum.

Draba aizoides.
grandiflora.
hirta.
incana.

Draba—*cont.*
incana var. Adamsii.
rupestris.
surculosa.

Dracocephalum austriacum.
Isabellae.
Moldavica.
nutans.
peregrinum.
tanguticum.

Dryas octopetala.
— var. lanata.

Drymaria cordata.

Ecballium Elaterium.

Eccremocarpus scaber.

Echinops banaticus.
cornigerus.
exaltatus.
niveus.

Echium pustulatum.

Elymus arenarius.
canadensis.
condensatus.
sibiricus.

Emilia flammea.

Epilobium Dodonaei.
luteum.
macropus.
rosmarinifolium.
sericeum.

Epipactis gigantea.
palustris.

Eragrostis pilosa.

Eremostachys laciniata.

Erigeron alpinus.
bellidifolius.
flagellaris.
glabellus.
glaucus.
macranthus.
mucronatus.
multiradiatus.
philadelphicus.
trifidus.
uniflorus.

Erinus alpinus.

Eriogonum subalpinum.

Eriophorum Scheuchzeri.

Eriophyllum caespitosum.

Erodium amanum.
Botrys.
carvifolium.
cheilanthifolium.
hymenodes.
macradenum.
Manescavii.
petraeum.
supradenum x.
Willkommianum.

Eryngium alpinum.
Bourgatii.
giganteum.
maritimum.
Oliverianum.
planum.
Sanguisorba.

Erysimum linifolium.
murale.
Perofskianum.
rupestre.

Erythraea Centaurium.
Massonii.

Eschscholzia caespitosa.
californica.

Eucharidium concinnum.

Euphorbia Characias.
Heldreichii.
helioscopia.
hiberna.
Preslii.
Welwitschii.
Wulfenii.

Farsetia clypeata.

Ferula communis.
Jaeschkeana.

Festuca arundinacea.
duriuscula.
glauca.
Hallerii.
heterophylla.
ingrata.
Myuros.
ovina var. tenuifolia.

Fragaria chiloensis.
indica.
virginiana.

Fritillaria Elwesii.
meleagris.

Fumaria capreolata.

Funkia longipes.
ovata.
Sieboldiana.

Gaillardia amblyodon.
lanceolata.

Galactites tomentosa.

Galanthus plicatus.

Galega officinalis.
orientalis.
patula.

Galeopsis pyrenaica.

Gaura coccinea.

Gentiana asclepiadea.
— var. striata.
Cruciata.
decumbens.
Fetisowii.
Freyniana.
Grombezewskii.
lagodechiana.
lutea.
macrophylla.
Pneumonanthe.
septemfida.
straminea.
tibetica.
— var. major.
verna.

Geranium albanum.
albiflorum.
angulatum.
argenteum.
armenum.
canariense.
eriostemon.
Farreri.
grandiflorum.
Grevilleanum.
ibericum.
macrorrhizum.
maculatum.
nepalense.
nodosum.
polyanthes.
reflexum.
refractum.
rivulare.
sanguineum.
sessiliflorum.
striatum.
subcaulescens.
silvaticum.
Wallichianum.
Wilfordii.
yedoense.

Gerbera Anandria.

Geum album.
chiloense.
coccineum.
elatum.
Heldreichii.
intermedium.
Jankae.
japonicum.
montanum.
parviflorum.
radiatum.
rivale.
vernum.

Gilia abrotanifolia.
achileaefolia.
androsacea.
capitata.
densiflora.
liniflora.
multicaulis.
squarrosa.
tricolor.

Gladiolus communis.
triphyllus.

Glaucium corniculatum.
flavum var. tricolor.

Glyceria plicata.

Glycine Soja.

Glycyrrhiza echinata.
lepidota.

Grindelia integrifolia.
robusta.
squarrosa.

Guizotia oleifera.

Gunnera chilensis.
manicata.

Gypsophila cerastioides.
elegans.
muralis.
paniculata.
prostrata.

Hablitzia tamnoides.

Hastingsia alba.

Hedysarum coronarium.
esculentum.
flavescens.
flexuosum.

Helenium Bigelovii.
nudiflorum.

Helianthella quinquenervis.
uniflora.

Helianthemum alpestre.
guttatum.
pulverulentum.
Tuberaria.

Helianthus mollis.
Nuttallii.
occidentalis.
rigidus.

Helichrysum arenarium.
bracteatum.
serotinum.
siculum.
Stoechas.

Heliopsis scabra.

Heloniopsis japonica.

Hemerocallis citrina.
flava.
minor.
nana.
Thunbergii.

Hemiphragma heterophyllum.

Hemizonia bicolor.

Heuchera bracteata.
Drummondii.
glabra.
villosa.

Hibiscus Trionum.

Hieracium amplexicaule.
aurantiacum.
bombycinum.
Bornmülleri.
bupleuroides.
cappadocicum.
gymnocephalum.
Heldreichii.
Jankae.
lanatum.
maculatum.
pannosum.
racemosum.
tridentatum.
umbellatum.
villosum.

Hierochloe borealis.

Hippocrepis multisiliquosa.
unisiliquosa.

Horminum pyrenaicum.

Hosackia oblongifolia.

Houstonia cœrulea.

Hyacinthus amethystinus.
azureus.
macrobotrys.
romanus.

Hydrophyllum canadense.

Hyoscyamus niger var. biennis.

Hypericum delphicum.
Desetangsii.
dubium.
elegans.
elodioides.
hirsutum.
humifusum.
montanum.
nummularium.
olympicum.

Hypericum—*cont.*
orientale.
polyphyllum.
pulchrum.
repens.
tomentosum.

Hypochaeris uniflora.

Hysterionica pinifolia.

Iberis amara.
Jordanii.
Lagascana.
pinnata.
sempervirens.
Tenoreana.
umbellata.

Illecebrum verticillatum.

Impatiens amphorata.
Balfouriana.
Roylei.
scabrida.

Incarvillea Delavayi.
grandiflora.

Inula barbata.
bifrons.
Brittanica.
Conyza.
ensifolia.
glandulosa.
Helenium.
hirta.
Hookeri.
montana.
orientalis.
racemosa.
Royleana.
salicina.
squarrosa.

Ionopsidium acaule.

Iris chrysographes.
Douglasiana.

Iris—*cont.*
foetidissima.
— var. citrina.
Forrestii.
graminea.
Hoogiana.
laevigata.
longipetala.
Sintenesii.
stolonifera.
versicolor.
Watsoniana.
Wilsonii.

Isatis glauca.
tinctoria.

Isopyrum fumarioides.

Iva xanthifolia.

Ixiolirion montanum.

Jasione Heldreichii.
montana.
perennis.

Jasonia tuberosa.

Juncus alpinus.
Chamissonis.
compressus.
glaucus.
squarrosus.

Jurinea alata.

Kentranthus calcitrapa.
macrosiphon.

Kitaibelia vitifolia.

Kniphofia breviflora.
Nelsonii.

Kochia arenaria.
scoparia.
trichophila.

Koeleria albescens.
phleoides.

Lactuca alpina.
Bourgaei.
hastata.
perennis.
virosa.

Lagurus ovatus.

Lallemantia canescens.
iberica.
peltata.

Lamium Galeobdolon.
longiflorum.
Orvale.

Laserpitium gallicum.
Nestleri.
peucedanoides.
Siler.

Lathyrus angulatus.
Aphaca.
articulatus.
cicera.
cirrhosus.
clymenum.
filiformis.
hirsustus.
latifolius.
lufeus.
maritimus.
montanus.
niger.
Nissolia.
ochrus.
odoratus.
palustris.
pisiformis.
rotundifolius.
sativus.
setifolius.
sphaericus.
sylvestris.
tenuifolius.
tingitanus.
tuberosus.
undulatus.
unijuga.

Lathyrus—*cont.*
variegatus.
varius.
venosus.

Lavatera cachemiriana.
Olbia.
thuringiaca.
trimestris.

Layia elegans.
platyglossa.

Leontopodium alpinum.

Leonurus Cardiaca.

Lepidium graminifolium.
latifolium.
Menziesii.
virginicum.

Leptosyne Douglasii.
maritima.
Stillmannii.

Leucojum aestivum.

Levisticum officinale.

Liatris pycnostachya.
scariosa.
spicata.

Libertia formosa.
grandiflora.

Lilium Farreri.
pardalinum.
pyrenaicum.

Limnanthes Douglasii.

Linaria anticaria.
concolor.
dalmatica.
heterophylla.
maroccana.
purpurea.
repens.

Linaria—*cont.*
spuria.
supina var. pyrenaica.
triphylla.
tristis.

Lindelofia spectabilis.

Lindheimera texana.

Linum capitatum.
catharticum.
flavum.
monogynum.
narbonense.
perenne.
usitatissimum.

Loasa triphylla.

Lobelia cardinalis.
fulgens.
inflata.
linnaeoides.
sessilifolia.
syphilitica.
urens.

Lonas inodora.

Lopezia racemosa.

Lotus Requienii.
siliquosus.
Tetragonolobus.

Lunaria rediviva.

Lupinus angustifolius.
Hartwegii.
micranthus.
mutabilis.
nanus.
nootkatensis.
onustus.
Paynei.
rivularis.
sulphureus.
varius.

Luzula albida.
Fosteri.
Hostii.
maxima.
nivea.

Lychnis alpina.
chalcedonica.
corsica.
Flos-jovis.
Githago.
Lagascae.
Preslii.
pyrenaica.
Sartori.
Viscaria.

Lycopus exaltatus.

Lygeum Spartum.

Lysichitum camtschatcense.

Lysimachia clethroides.
davurica.
Ephemerum.
stricta.

Lythrum alatum.
hyssopifolium.
virgatum.

Macrotomia echioides.

Madia dissitiflora.
elegans.

Malva Alcea.
moschata.
parviflora.
rotundifolia.

Malvastrum campanulatum.
limense.

Matthiola bicornis.
thessala.

Matricaria Tchihatchewii.

Meconopsis cambrica.
Prattii.
Wallichii.

Medicago Echinus.
falcata.
hispida var. pentacycla.
maculata.
Murex.
orbicularis.
rigidula.
scutellata.
tuberculata.
turbinata.

Melanthium virginicum.

Melica altissima.
ciliata.
papilionacea.

Melilotus albus.
indicus.

Mentzelia Lindleyi.

Mertensia echioides.
paniculata.
sibirica.

Mesembryanthemum
pyropaeum.

Meum athamanticum.

Mibora verna.

Micromeria graeca.

Microseris Lindleyi.

Milium effusum.

Mimulus cardinalis.
Lewisii.
luteus.
primuloides.
ringens.

Mirabilis divaricata.
Froebelii.
Jalapa.

Mitella pentandra.

Modiola multifida.

Molinia coerulea.

Molopospermum cicutarium.

Monarda didyma.
fistulosa.

Monolepis trifida.

Moraea glaucopis.

Morina longifiolia.

Moscharia pinnatifida.

Muscari Argaei.
armeniacum.
compactum.
conicum.
neglectum.
paradoxum.
racemosum.

Myosotis alpestris.
Stabiana.
versicolor.

Myosurus minimus.

Myriactis nepalensis.

Myrrhis odorata.

Napaea dioica.

Narcissus Bulbocodium.
cyclamineus.
triandrus.

Nardus stricta.

Nemophila insignis.
Menziesii.

Nepeta concolor.
granatensis.
longiflora.
macrantha.
marifolia.
Mussinii.
Nepetella.
nuda.
ucranica.

Nicandra physaloides.
violacea.

Nicotiana affinis.
Langsdorffii.
paniculata.
rustica.
Tabacum.

Nigella damascena.
hispanica.
integrifolia.
orientalis.

Nolana atriplicifolia.

Nothoscordum fragrans.

Oenothera amoena.
Berteriana.
densiflora.
fruticosa.
glauca.
lepida.
missouriensis.
Oakesiana.
odorata.
pumila.
riparia.
tetraptera.
Williamsonii.

Omphalodes linifolia.

Onobrychis gracilis.
Tournefortii.

Ononis alopecuroides.
biflora.
reclinata.

Onosma albo-roseum.
stellulatum.
tauricum.

Orchis foliosa.
latifolia x maculata.

Origanum hybridum.

Ornithogalum arcuatum.

Oxalis enneaphylla.
magellanica.

Oxybaphus nyctagineus.

Oxytropis argentea.
baicalensis.
campestris.
lapponica.
strobilacea.
sulphurea.

Paeonia Delavayi.
hirsuta.
mollis.
paradoxa.
peregrina.
Veitchiana.
Wittmanniana.
Woodwardii.

Pallenis spinosa.

Papaver aculeatum.
apulum.
arenarium.
Argemone.
commutatum.
glaucum.
hybridum.
laevigatum.
lateritium.
nudicaule.

Papaver—*cont.*
orientale.
— var. bracteatum.
pavoninum.
pilosum.
rupifragum.
somniferum.

Paracaryum glochidiatum.

Paradisea Liliastrum.

Parnassia palustris.

Paspalum dilatatum.

Patrinia gibbosa.

Peganum Harmala.

Pennisetum macrourum.

Pentstemon arizonicus.
campanulatus.
confertus.
cordifolius.
deustus.
diffusus.
glaucus.
heterophyllus.
hirsutus.
humilis.
laevigatus.
Menziesii var. Douglasii
ovatus.
pubescens.
Scouleri.
unilateralis.

Perezia multiflora.

Petunia axillaris.

Peucedanum coriaceum.
Ostruthium.

Phacelia campanularia.
congesta.
malvaefolia.
tanacetifolia.
viscida.

Phalaris tuberosa.

Phlomis armeniaca.
Herba-venti.
Samia.
tuberosa.
umbrosa.
viscosa.

Phuopsis stylosa.

Physalis Alkekengi.
Franchetii.

Physostegia virginiana.

Phyteuma canescens.
Halleri.
limonifolium.
lobelioides.
nigrum.
orbiculare.
Scheuchzeri.
spicatum.

Phytolacca acinosa.
clavigera.
decandra.

Picridium tingitanum.

Plantago alpina.
Coronopus.
Cynops.
Lagopus.
maritima.
maxima.
Psyllium.

Platycodon grandiflorum.
— var. Mariesii.

Platystemon californicus.

Pleurospermum Golaka.

Poa caesia.
caespitosa.
Colensoi.
nevadensis.

Podolepis acuminata.

Polemonium coeruleum.
foliosissimum.
pauciflorum.
reptans.

Polygonum affine.
Bistorta.
capitatum.
rude.
sphaerostachyum.
viviparum.
Weyrichii.

Polylepis ivesioides.

Polypogon monspeliensis.

Portulaca grandiflora.

Potentilla alchemilloides.
alpestris var. pyrenaica.
argentea.
arguta.
argyrophylla.
— var. leucochroa.
chrysantha.
crinita.
dealbata.
Delavayi.
Detommassii.
Drummondii.
Fenzlii.
fragarioides.
fragiformis.
fulgens.
gracilis.
Griffithii.
Hippiana.
Hopwoodiana.
Leschenaultiana.
leuconota.
Meyeri.
montenegrina.
Mooniana.
multifida.
nepalensis.
nevadensis.

Potentilla—*cont.*
nivea.
norvegica.
pennsylvanica.
recta.
rivalis.
rupestris.
sericea.
speciosa.
supina.
tanacetifolia.
taurica.
tridentata.
villosa.

Poterium obtusum.

Pratia arenaria.
begonifolia.

Prenanthes purpurea.

Preslia cervina.

Primula anisodora.
aurantiaca.
Beesiana.
Bulleyana.
capitata.
chungensis.
denticulata.
farinosa.
frondosa.
japonica.
longiflora.
luteola.
Morsheadiana.
pulverulenta.
pycnoloba.
saxatilis.
secundiflora.
sikkimensis.
Veitchii.
vittata.
Wardii.

Prosartes oregana.

Psoralea macrostachys.
Onobrychis.
orbicularis.

Ramondia pyrenaica.

Ranunculus aconitifolius.
amplexicaulis.
cymbalaria.
falcatus.
Gouanii.
gramineus.
lanuginosus.
muricatus.
nissanus.
ophioglossifolius.
platanifolius.

Raoulia australis.
subsericea.

Reseda virgata.

Rhagadiolus edulis.

Rheum Collinianum.
palmatum.
pruinosum.
Rhaponticum.

Rodgersia aesculifolia.
pinnata.
podophylla.
Purdomii.
sambucifolia.
tabularis.

Roemeria hybrida.

Romanzoffia unalaschcensis.

Romulea Bulbocodium.
cruciata.
ligustica.

Rudbeckia ampla.
californica.
laciniata.
speciosa.

Rumex maritimus.
maximus.
pulcher.
salicifolius.

Salvia argentea.
Bertolonii.
Bulleyana.
campanulata.
candidissima.
digitaloides.
glutinosa.
hierosolymitana.
Horminum.
Jurasicii.
nemorosa.
nutans.
Przewalskii.
Schiedeana.
Sclarea.
verticillata.
villicaulis.

Samolus Valerandii.

Sanicula europaea.

Santolina pinnata.

Saponaria cerastioides.
ocymoides.
Vaccaria.
Wiemannii.

Saracha umbellata.

Saururus Lourieri.

Saussurea albescens.
denticulata.
eriolepis.
hypoleuca.
pectinata.
salicifolia.

Saxifraga bronchialis.
calabrica.
canaliculata.
cartilaginea.
cernua x granulata.
cochlearis.
— var. minor.
corymbosa.
Cotyledon.
—var. pyrenaica.
crustata.
decipiens.
Delavayi.
diversifolia.
Geum. var. crenata.
— var. dentata.
granulata.
hirsuta.
Kolenatiana.
lingulata.
— var. Albertii.
— var. australis.
— var. lantoscana.
longifolia.
Macnabiana.
Mertensiana.
mutata.
pedemontana.
rotundifolia.
Sibthorpii.
sponhemica.
Wallacei.
Zimmeteri.

Scabiosa caucasica.
Columbaria.
crenata.
daucoides.
fumarioides.
graminifolia.
Kitaibelii.
longifolia.
maritima.
ochroleuca.
palustris.
prolifera.
Pterocephala.
sylvatica.
vestina.

Schizanthus pinnatus.
retusus.

Scolymus hispanicus.

Scopolia sinensis.

Scorpiurus vermiculata.

Scorzonera hispanica.
rosea.

Scrophularia chrysantha.
scorodonia.
sylvatica.

Securigera Coronilla.

Sedum altissimum.
anopetalum.
Cepaea.
Ellacombianum.
Ewersii.
kamtschaticum.
maximum.
Middendorffianum.
murale.
populifolium.
rariflorum.
reflexum.
roseum.
Semenovii.
spathulifolium.
spurium.
stoloniferum.

Selinum tenuifolium.
vaginatum.

Senecio adonidifolius.
alpinus.
clivorum.
cordifolius.
Doria.
Doronicum.
elegans.
japonicus.
Ledebouri.
Ligularia.
nemorensis.
Przewalskii.
sarecenicus.

Senecio—*cont.*
squalidus.
stenocephalus.
suaveolens.
tanguticus.
Veitchianus.
Wilsonianus.

Serratula coronata.
heterophylla.
quinquefolia.
tinctoria.

Sesleria autumnalis.
nitida.

Setaria ambigua.
glauca.
italica.
verticillata.

Sida Napaea.

Sidalcea candida.
neomexicana.
spicata.

Sideritis scordioides.

Silene alpestris.
Armeria.
Asterias.
colorata.
conica.
conoidea.
cretica.
echinata.
elegans.
Elizabethae.
fimbriata.
fruticosa.
gallica.
linicola.
Muscipula.
noctiflora.
nocturna.
Otites.
pendula.
quadrifida.

Silene—*cont.*
quinquevulnera.
Reichenbachii.
saxatilis.
Saxifraga.
squamigera.
tatarica.
viridiflora.
Zawadzkii.

Siler trilobum.

Silphium pinnatifidum.
terebinthinaceum.
trifoliatum.

Silybum eburneum.
Marianum.

Smilacina racemosa.

Smyrnium perfoliatum.

Spartina alterniflora.
Townsendii.

Sphaeralcea australis.
Fendleri.
longisepala.

Spilanthes oleracea.

Spiraea Aruncus.
decumbens.
palmata.
vestita.

Stachys annua.
citrina.
grandiflora.
longifolia.
recta.
scardica.
setifera.

Steironema ciliatum.

Stenanthium robustum.

Stevia ovata.
purpurea.

Stokesia cyanea.

Stipa Calamagrostis.
papposa.
pennata.

Streptopus distortus.

Swertia connata.
longifolia.
perennis.

Symphyandra pendula.
Wanneri.

Symphytum caucasicum.
orientale.
peregrinum.

Symplocarpus foetidus.

Tagetes pumila.
signata.

Tanacetum argenteum.

Telephium Imperati.

Tellima grandiflora.

Tetragonia expansa.

Teucrium Botrys.
canadense.
Chamaedrys.
lucidum.
montanum.
pryenaicum.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
corynellum.
cultratum.
dioicum.
dipterocarpum.

Thalictrum—*cont.*
Fendleri.
flavum.
foetidum.
glaucum.
minus.
squarrosum.

Thermopsis fabacea.

Thymus odoratissimus.

Tofieldia calyculata.
palustris.

Tragopogon major.
porrifolius.

Trautvetteria palmata.

Tricyrtis latifolia.
macropoda.

Trifolium alpestre.
angustifolium.
Johnstonii.
Lupinaster.
maritimum.
montanum.
ochroleucum.
pannonicum.
physodes.
tomentosum.

Trigonella coerulea.
corniculata.
foenum-graecum.
polycerata.
radiata.

Trillium grandiflorum.

Tripsacum dactyloides.

Trollius chinensis.
pumilus.
sinensis.
yunnanensis.

Troximon laciniatum.

Tulipa australis.
Kaufmanniana.
Sprengeri.

Tunica prolifera.
Saxifraga.

Urospernum Dalechampii.

Ursinia anthemoides.
pulchra.

Urtica cannabina.
pilulifera.

Valerianella echinata.
eriocarpa.

Vella spinosa.

Veratrum album.
nigrum.

Verbascum Blattaria.
Chaixii.
leianthum.
Libani.
Lychnitis.
nigrum var. album.
plicatum.
Wiedmannianum.

Verbena bonariensis.
hispida.
urticaefolia.

Verbesina encelioides.
helianthoides.
Purpusii.
subcordata.

Veronica austriaca.
Bachofenii.
cataractae.
euxina.
filifolia.
gentianoides.

Veronica—*cont.*
incana.
longifolia.
Lyallii.
morrisonicola.
orientalis.
— var. tenuifolia.
pinguifolia.
prostrata.
saxatilis.
spicata.
— var. nitens.
thracica.
virginica.

Vicia angustifolia.
atropurpurea.
bithynica.
calcarata.
fulgens.
gigantea.
grandiflora.
lutea.
melanops.
Orobus.
pyrenaica.
striata.
tenuifolia.
unijuga.
villosa.

Vincetoxicum fuscatum.
nigrum.

Viola arenaria.
canadensis.
elatior.
lutea.
persicifolia.
stagnina.
tricolor var. nigra.

Volutarella muricata.

Zephyranthes candida.

Zygadenus elegans.
Nuttallii.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

Acanthopanax divaricatus.
Giraldii.
lasiogyne.
sessiliflorus.
setchuenensis.

Acer cappodocicum.
circinatum.
creticum.
Heldreichii.
— var. macropterum.
hyrcanum.
insigne.
japonicum var. microphyllum.
Lobelii.
macrophyllum.
micranthum.
monspessulanum.
neglectum.
nikoense.
Trautvetteri.

Aesculus californica.
indica.

Alnus cordata.
elliptica.
firma.
glutinosa.
hirsuta.
incana.
japonica.
nitida.
oregona.
orientalis.
serrulata.
sinuata.
tenuifolia.
viridis.
— var. mollis.

Amelanchier alnifolia.
canadensis.
florida.
rotundifolia.

Aralia chinensis.
— var. glabrescens.

Arbutus Menziesii.
Unedo.

Arctostaphylos Manzanita.
tomentosa.

Asimina triloba.

Baccharis patagonica.

Berberis actinacantha.
aggregata.
— var. Prattii.
angulosa.
aristata.
atrocarpa.
Beaniana.
brachypoda.
buxifolia.
canadensis.
Chitria.
concinna.
consimilis.
Darwinii.
diaphana.
dictyophylla.
— var. albicaulis.
Edgeworthiana.
Francisci-Ferdinandii.
Gagnepainii.
Hookeri.
Lecomtei.
Leichtlinii.
Lycium.
orthobotrys.
polyantha.
rubrostilla.
Sargentiana.
sinensis.
Soulieana.
Stapfiana.
subcaulialata.

Berberis—*cont.*
thibetica.
Thunbergii.
Tischleri.
umbellata.
Veitchili.
virescens.
Wilsonae.
yunnanensis.

Betula coerulea.
davurica.
Ermanii.
— var. nipponica.
fruticosa.
humilis.
Jacquemontii.
japonica.
— var. mandshurica.
lenta.
lutea.
Medwediewii.
papyrifera.
— var. occidentalis.
pumila.
utilis.

Bruckentlialia spiculifolia.

Buddleia albiflora.
alternifolia.
Fallowiana.
Farreri.
nivea.
stenostachya.
variabilis.
— var. magnifica.
— var. Vietchiana.

Bupleurum fruticosum.

Buxus sempervirens.

Callicarpa Giraldiana.
japonica.

Calycanthus occidentalis.

Caragana ambigua.
arborescens.
— var. Redowskii.
aurantiaca.

Caragana—*cont.*
Boisii.
decorticans.
frutescens.
sophoraefolia.

Carmichaelia australis.
flagelliformis.

Carpinus caroliniana.
orientalis.
Turczaninowii.

Caryopteris Mastacanthus.

Cassandra calyculata.

Cassinia fulvida.
retorta.
Vauvilliersii.

*Ceanothus americanus.
thyrsiflorus.

Cedrus atlantica.
Libani.

Celastrus Rosthornianus.
rugosus.
scandens.

Celtis glabrata.
occidentalis.

Cephalotaxus drupacea.
Fortunei.
pedunculata.

Chionanthus virginica.

Cistus canescens.
corbariensis.
florentinus.
hirsutus.
ladaniferus.
laurifolius.
monspeliensis.
populifolius.
villosus.

Clematis aethusifolia var. latisecta.
glauca var. akebioides.
connata.
— var. velutina.
Douglasii var. Scottii.
Flammula.
fusca.
intermedia.
lasiandra.
macropetala.
montana.
— var. rubens.
orientalis.
Rehderiana.
serratifolia.
Spooneri.
tangutica.
— var. obtusiuscula.
Veitchiana.
virginiana.
Vitalba.
Viticella.

Clerodendron Fargesii.
trichotomum.

Clethra acuminata.
alnifolia.
— var. paniculata.
barbinervis.
monostachya.
tomentosa.
Wilsonii.

Cocculus trilobus.

Colutea arborescens var. bullata.
media.
orientalis.
persica.

Corema album.

Coriaria japonica.
terminalis.

Cornus alba.
Amomum.
Bretschneideri.
controversa.
glabrata.
Hemsleyi.
Kousa var. chinensis.
Purpusii.
sanguinea.
stolonifera.

Corokia virgata.

Cotoneaster acutifolia.
affinis.
amoena.
apiculata.
bacillaris.
— var. obtusa.
bullata.
buxifolia.
congesta.
Dammeri.
Dielsiana.
divaricata.
Franchetii.
frigida.
Harroviana.
hebephylla.
Henryana.
horizontalis.
hupehensis.
Lindleyi.
lucida.
melanocarpa var. laxiflora.
microphylla.
— var. thymifolia.
multiflora.
— var. calocarpa.
obscura.
pannosa.
prostrata.
racemiflora.
— var. Nummularia.
rotundifolia.
salicifolia.
— var. rugosa.
Simonsii.

Cotoneaster—*cont.*
turbinata.
uniflora.
Zabelii.

Crataegus acclivis.
ambigua.
arkansana.
asperifolia.
Azarolus.
Beckwithae.
berberifolia.
Boyntonii.
Buckleyi.
canadensis.
Carrierei.
chlorosarca.
coccinea.
coloradoides
cordata.
corporea.
cuneata.
densiflora.
dilatata.
Dippeliana.
Ellwangeriana.
elongata.
Faxonii.
ferentaria.
filipes.
Fisheri.
Forbesae.
Gaultii.
georgiana.
gloriosa.
infera.
intricata.
Jackii.
Jonesae.
Lambertiana.
lenta.
leptophylla.
Macauleyae.
modesta.
mollis.
neo-Canbyi.
orientalis.
Peckii.
praecox.

Crataegus—*cont.*
pruinosa.
prunifolia.
punctata.
semi-orbiculata.
sinaica.
stipulosa.
succulenta.
tanacetifolia.
verecunda.
viridis.
Wattiana.

Cupressus Lawsoniana.
macrocarpa.
nootkatensis.
thyoides.

Cydonia cathayensis.
Maulei.

Cytisus austriacus.
— var. Heuffelii.
eriocarpus.
grandiflorus.
nigricans.
purgans.
purpureus.
ratisbonensis.
— var. horniflorus.
scoparius.
— var. Andreanus.
— var. sulphureus.
sessilifolius.
Spachianus.
supinus.

Daboëcia polifolia.

Danae racemosa.

Daphne Mezereum.

Daphniphyllum macropodum.

Davidia Vilmoriniana.

Deutzia corymbosa.
gracilis.
longifolia.
— var. Veitchii.
macrocephala.
scabra.

Deutzia—*cont.*
Sieboldiana.
Vilmorinae.
Wilsonii.

Diervilla floribunda.
florida.
japonica.
Lonicera.
sessilifolia.
venosa.

Diospyros Lotus.

Dipelta floribunda.

Eccremocarpus scaber.

Elaeagnus argentea.
multiflora.
umbellata.

Enkianthus perulatus.

Erica ciliaris.
cinerea.
scoparia.
stricta.
Tetralix.

Eucryphia pinnatifolia.

Euonymus japonicus.
latifolius.
Maackii.
oxyphyllus.
planipes.
radicans.
yedoensis.
— var. Koehneana.

Evodia hupehensis.

Fallugia paradoxa.

Fontanesia phillyraeoides.

Forsythia europeae.

Fraxinus oregona.
Ornus.

Garrya elliptica.

Gaultheria hispida.
procumbens.
pyroloides.
Shallon.

Genista aetnensis.
dalmatica.
hispanica.
lydia.
pilosa.
radiata.
sagittalis.
tinctoria.
— var. elatior.
virgata.

Halesia carolina.

Hamamelis japonica.
— var. arborea.
— var. Zuccariniana.
mollis.

Helianthemum alpestre.
alpinum.
alyssoides.
appeninum.
formosum.
vulgare.
— var. rhodanthum.

Hoheria Lyallii.

Hydrangea Bretschneideri.
paniculata.
petiolaris.
radiata.
xanthoneura.
— var. glabrescens.
— var. setchuenensis.
— var. Wilsonii.

Hymenanthera crassifolia.

Hypericum Androsaemum.
aureum.
elatum.
galioides.
hircinum.
Hookerianum.
inodorum.
Kalmianum.

Hypericum—*cont.*
lobocarpum.
patulum.
— var. Henryi.
prolificum.
uralum.
Webbii.

Ilex decidua.
integra.
opaca.
serrata.
verticillata.

Indigofera hebepetala.
Gerardiana.
Potaninii.

Jamesia americana.

Jasminum Beesianum.
humile.
Wallichianum.

Juglans nigra.

*Juniperus Cedrus.
*communis.
*foetidissima.
*Oxycedrus.
*virginiana.

Kalmia angustifolia.
cuneata.
glauca.
latifolia.

Koelreuteria apiculata.

Laburnum alpinum.
vulgare.

Ledum latifolium.
palustre.

Leiophyllum buxifolium.

Leptospermum Liversidgei.
scoparium.

Leucothoë Catesbaei.
racemosa.

Leycesteria formosa.

Ligustrum Delavayanum.
Ibota.
insulare.
Quihoui.
yunnanense.

Lonicera alpigena.
chaetocarpa.
chrysantha.
— var. turkestanica.
deflexicalyx.
dioica.
floribunda.
Henryi.
iberica.
involucrata.
lanceolata.
Ledebourii.
longa.
micrantha.
minutiflora.
Morrowii.
muscavensis.
nigra.
obovata.
orientalis.
— var. longifolia.
prostrata.
quinquelocularis var. translucens.
Ruprechtiana.
segreziensis.
Sullivantii var. hirsuta.
tatarica.
— var. micrantha.
trichopoda.
trichosantha.
Xylosteum.

Lupinus arboreus.

Lycium chinense.

Lyonia ligustrina.

Maackia amurensis.

Magnolia glauca.
Lennei.
parviflora.
Soulangeana.

Mahonia nervosa.

Margyricarpus setosus.

Meliosma cuneifolia.

Menispermum canadense.

Menziesia pilosa.

Microglossa albescens.

Muehlenbeckia axillaris.

Myrtus communis.

Neillia capitata.
opulifolia.
Torreyi.

Nuttallia cerasiformis.

Olearia albida.
erubescens.
furfuracea.
Haastii.
odorata.

Ononis fruticosa.

Osmanthus Delavayi.

Osteomeles Schwerinae.
— var. microphylla.

Oxycoccus macrocarpus.

Oxydendrum arboreum.

Paeonia lutea.

Paliurus Spina-Christi.

Pernettya mucronata.

Pertya senensis.

Petteria ramentacea.

Phellodendron chinense.
sachalinense.

Philadelphus argyrocalyx.
brachybotrys.
californicus.
coronarius.
Falconeri.
incanus.
inodorus.

Philadelphus—*cont.*
latifolius.
Lewisii.
pekinensis.
pendulifolius.
pubescens.
Satsumanus.
sericanthus.
speciosissimus.
tomentosus.
verrucosus.
Wilsonii.

Photinia arbutifolia.
Beauverdiana.

Phyllodoce empetriformis.

Pieris formosa.
japonica.
mariana.

Pinus Armandii.
Bungeana.
*funebris.
*halepensis.
*Laricio.
parviflora.

Platanus acerifolia.
orientalis.

Potentilla fruticosa.

Prunus Avium.
cerasifera var. divaricata.
emarginata.
hortulana.
incisa.
japonica.
Lannesiana.
serotina.
serrulata.
tomentosa.

Ptelea isophylla.
trifoliata.
— var. crenata.

Pterostyrax hispida.

Pyracantha angustifolia.
coccinea.
crenulata.
Gibbsii.
— var. yunnanensis.
Rogersiana.

Pyrus alnifolia.
americana.
— var. nana.
arbutifolia.
Aria var. majestica.
Aucuparia var. moravica.
Conradinae.
crataegifolia.
decurrens.
Hostii.
kansuensis.
Meinichii.
minima.
Niedzwetzkyana.
pekinensis.
pinnatifida.
pohuashanensis.
Prattii.
prunifolia.
rotundifolia.
Sargentii.
sikkimensis.
sorbifolia.
Sorbus.
theifera.
Toringo.
toringoides.
Torminalis.
Tschonoskii.
Vilmorinii.
yunnanensis.
— var. Veitchii.
Zahlbruchneri.
Zumi.

Quercus Libani.
phillyraeoides.
rubra.

Raphiolepsis japonica.

Rhamnus carthartica.
davurica.
Erythroxylon.
fallax.
Frangula.
imeretina.
infectoria.
japonica.
petiolaris.
Purshiana.
spathulifolia.
utilis.

Rhododendron ambiguum.
brachycarpum.
californicum.
calophytum.
catawbiense.
cheilanthum.
concinnum.
decorum.
discolor.
Fargesii.
ferrugineum.
Fortunei.
halense.
hippophaeoides.
Houlstonii.
impeditum.
lochmium.
maximum.
micranthum.
oreotrephes.
orthocladum.
praevernum.
racemosum.
rhombicum.
rubiginosum.
Smirnowii.
Souliei.
sutchuenense.
Tschonoskii.
Vaseyi.
villosum.
viscosum.
yanthinum.
yunnanense.

Rhodotypos kerrioides.

Rhus glabra.
Potaninii.
verniciflua.

Ribes alpinum.
cereum.
divaricatum.
futurum.
holosericeum.
mandshuricum.
robustum.
rotundifolium.
Warszewiczii.
Wolfii.

Rosa baicalensis.
cinnamomea.
Davidii.
— var. elongata.
elegantula.
glutinosa.
gymnocarpa.
Helenae.
Hugonis.
humilis.
involuta.
macrophylla.
mollis.
Moyesii.
multibracteata.
nitida.
nutkana.
omeiensis.
— var. atrosanguinea.
— var. polyphylla.
— var. pteracantha.
pendulina.
— var. pyrenaica.
pisocarpa.
rugosa.
Seraphinii.
sericea.
sertata.
setipoda.
Soulieana.
spinulifolia.
stylosa var. evanida.
Sweginzowii.
virginiana.

Rosa—*cont.*
Webbiana.
Woodsii.
— var. Fendleri.

Rubus deliciosus.
flosculosus.
Giraldianus.
inopertus.
lasiostylus.
mesogaeus.
nigro-baccus.
parvifolius.
— var. Fraserianus.
phoenicolasius.
pubescens.
Swinhoei.
thibetanus.
xanthocarpus.

Ruscus aculeatus.

Ruta graveolens.

Sambucus racemosa.

Schinus crenatus.
dependens.

Sciadopitys verticillata.

Securinega fluggeoides.
ramiflora.

Senecio compactus.

Skimmia japonica.

Smilax excelsa.
rotundifolia.
scobinicaulis.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisonii.
arborea.
— var. glabrata.

Spiraea—*cont.*
arcuata.
betulifolia.
bracteata.
canescens.
discolor.
expansa.
japonica.
Lindleyana.
salicifolia.
sanssouciana.
sorbifolia var. stellipila.
Veitchii.
Wilsonii.

Staphylea colchica.
Coulombieri.
pinnata.
trifolia.

Stranvaesia Davidiana var. undulata.
salicifolia.

Styrax japonicus.
Wilsonii.

Symphoricarpus Heyeri.
mollis.
occidentalis.
racemosus.
rotundifolius.

Syringa Emodi.
japonica.
Julianae.
reflexa.
villosa.
Wilsonii.
yunnanensis.

Taxus cuspidata.

Thuya orientalis.

Urnbellularia californica.

Vaccinium Arctostaphylos.
hirsutum.
ovatum.

Veronica Colensoi.
— var. glauca.
laevis.
macrocarpa.
pimeleoides.
salicifolia.
Traversii.

Viburnum betulifolium.
brevipes.
burejaeticum.
cotinifolium.
Davidii.
dilatatum.
Henryi.
hupehense.
Lantana.
lobophyllum.
Opulus var. americanum.
ovatifolium.
rhytidophyllum.
rufidulum.
theiferum.
Veitchii.
venosum.

Vitis Coignetiae.
vinifera.
vulpina.

Zanthoxylum Bungei.
piperitum.

Zenobia speciosa.
— var. pulverulenta.

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